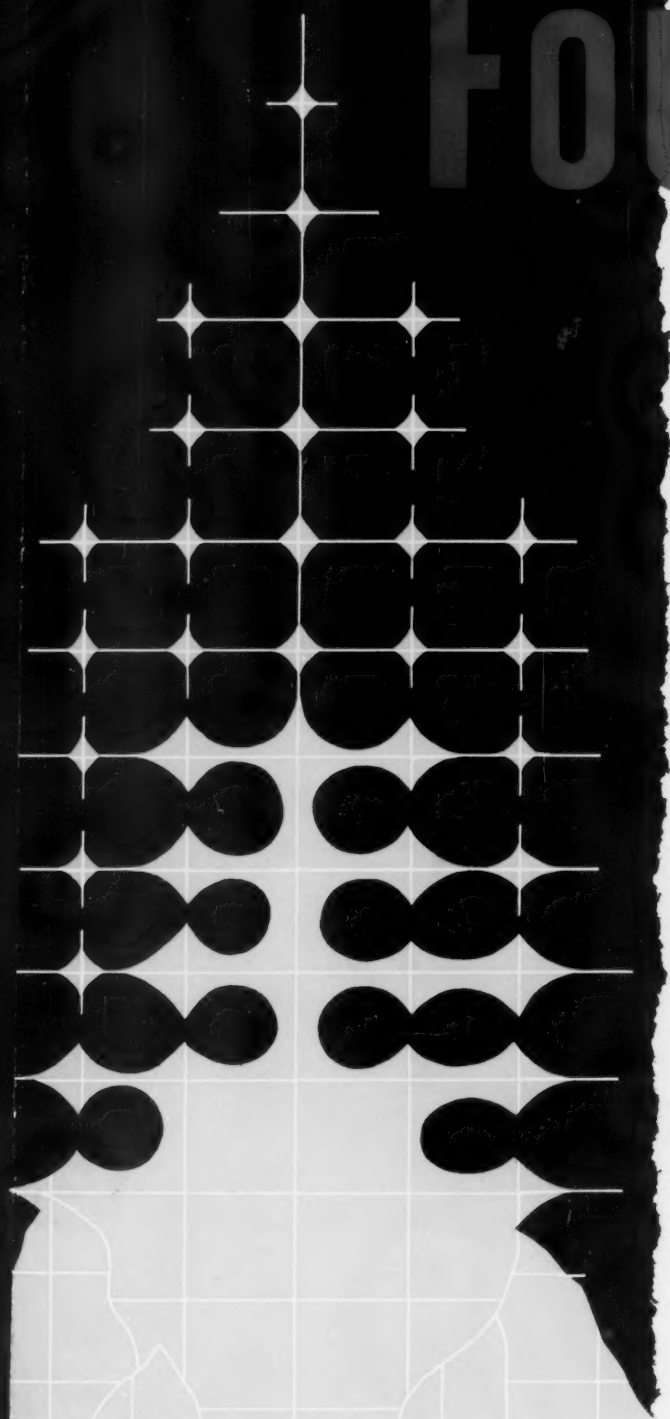
DECEMBER
1 9 5 7

FOUNDRY

A PENTON PUBLICATION



✔ **Carbon-Pickup in the Cupola**
Here's a test for assessing the factors that affect it
—Page 70

✔ **Mold-Metal Interface Reactions**
These reactions will influence casting surface and dimensions
—Page 76

✔ **Epoxy Plastic for Patterns**
Production methods in making both coreboxes and patterns
—Page 86

✔ **Practical Production Controls**
They are necessary for efficient use of plant and raw materials
—Page 91

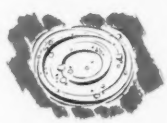
SHRINKAGE IN TIN BRONZE

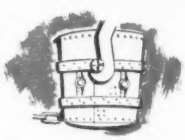
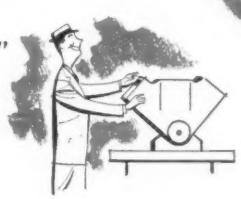
Page 81

success story of a high quality casting

"I came from very humble beginnings . . . a load of high sulphur scrap picked up at bargain prices and mixed with low-grade coke in the cupola charge.

"But I began to show my metal when

was added to the cupola. It reduced the sulphur content in the melt, checked bridging for better mixing, sped up the combustion reactions. 

"When I graduated to the ladle,  I became even more refined, thanks to PURITE's ability to desulphurize to uniform specifications. I entered the mold as clean, quiet-pouring iron and cooled to a strong, machineable casting that satisfied the customer's most rigid specifications." 

Effective . . . economical . . . simplicity itself to store and use . . . the 2-pound pigs of non-crumbling PURITE have been proved in use for over 30 years. Next time you contact your foundry supply house, ask about Purite. Or write us today.

PURITE

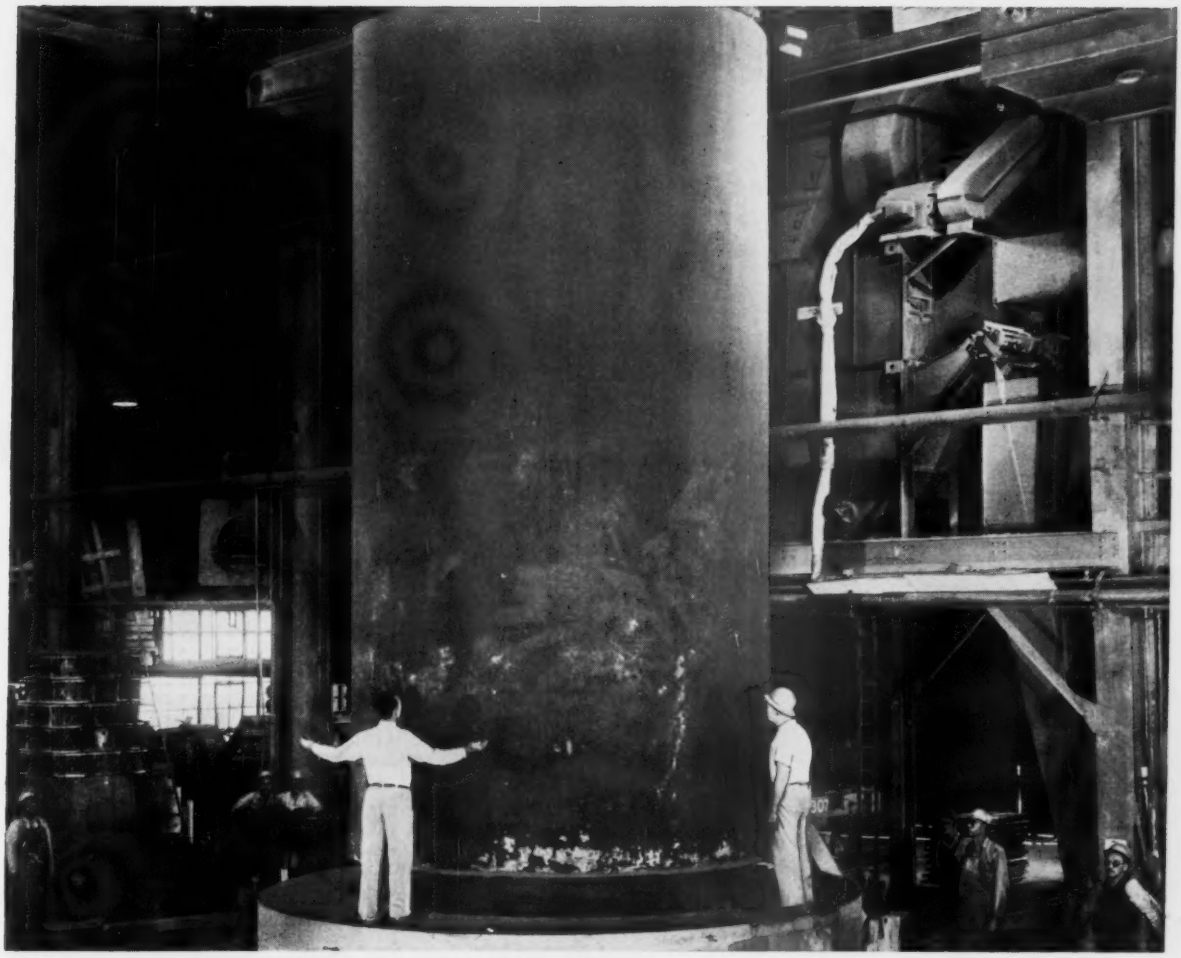
OLIN MATHIESON CHEMICAL CORPORATION

INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MARYLAND

PURITE® is a trademark

4720

Circle 551 on Page 51



40-Ton Dryer Roll being removed from the mold at Newport News Shipbuilding and Dry Dock Company, Newport News, Virginia.

How nickel cast iron helps take the risk out of large castings

Here's a Yankee dryer roll for example. It weighs 40 tons. Length: 262 inches. Diameter: 12 feet.

It's just too big to take a chance. The foundry can't afford a reject. Especially when a reliable metal can assure pressure tightness... ample strength... a smooth surface... and easy machining.

Nickel cast iron assures a sound casting through uniform metal structure

Nickel irons combine fine graphite in a uniform matrix. They promote strength and rigidity, and a surface free of imperfections.

Because of these properties Newport News specifies a nickel cast iron for these rolls. Even with today's high steam pressure this nickel cast iron dryer roll will stay pressure tight. It's definitely not a leaker. Its surface, thanks to nickel cast iron, is uniform and smooth.

The roll easily meets the strength levels required by the boiler code. The basic 1.34% nickel iron composition achieves 40,000 minimum tensile strength every time.

And Newport News needs nickel cast iron to get the high polish, mirror-like finish required on the roll. Uniform structure and the absence of carbides and defects afford a readily machined and polished roll.

You, too, can get this dependability in heavy iron castings – or in light ones that need high strength, pressure tightness and good machinability. Nickel cast irons are quality castings. And quality castings are good business ... for you, and for your customer.

For assistance on specific composition problems, contact Inco. Our engineers will gladly provide the metallurgical information you want.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK

NICKEL CAST IRONS

BEST FOR YOU BECAUSE THEY'RE BEST FOR YOUR CUSTOMERS

ADCOSIL

BEST FOR CO_2 CORES...

An exclusive feature in ADCOSIL is a color indicator that tells when to stop gassing a CO_2 core. The core mix is tinted a royal purple . . . then fades to a natural sand color when the core is cured throughout.

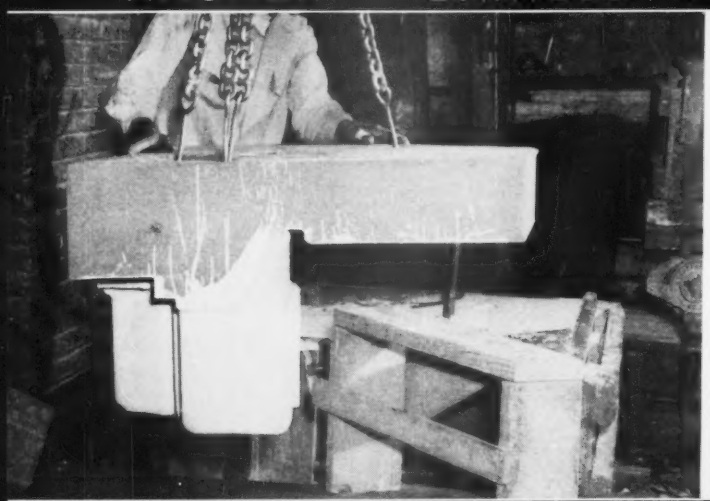
ADCOSIL helps determine where to place core vents and how many to use; helps rig new boxes and patterns; prevents under-gassing, over-gassing; encourages cores designed for most efficient flow of gas; cuts time and costs; saves gas.

Flowability, workability, core hardness, and long bench life are inherent in ADCOSIL sand mixtures.

Several types are available:

For ferrous metals . . . . . ADCOSIL F
For non-ferrous metals . . . . . ADCOSIL NF
For super-collapsibility, all metals. ADCOSIL SC

ARCHER • DANIELS • MIDLAND COMPANY



LIN-O-SET

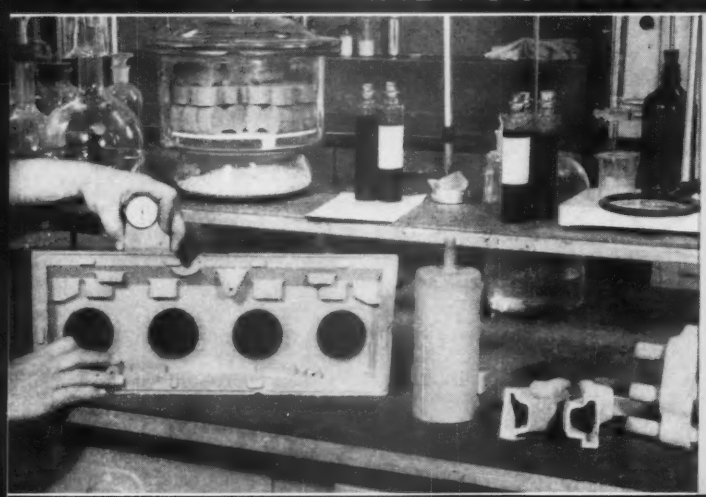
BEST FOR AIR SET CORES...

Original LIN-O-SET, introduced by ADM and praised by large jobbing foundries coast-to-coast, is scarcely a year old. Still, a newer and more phenomenal air-setting binder, LIN-O-SET II, is already available to foundries searching for maximum efficiency.

LIN-O-SET II works in room temperature at exceptional speed hardening the "core of the core" almost as fast as the exposed surfaces. An ADM "first", this development takes the guesswork out of drawing, since the curing of a LIN-O-SET II core combines internal polymerization with surface oxidation.

All this . . . plus the better-known LIN-O-SET features; minimum ramming; saving in cleaning time; thorough collapsibility; elimination of excessive rodding; control of set-up time; improved accuracy; elimination of objectionable odors and toxic gases.

FEDERAL FOUNDRY SUPPLY DIVISION



ADMIREZ

BEST FOR SHELL-MOLDS AND SHELL-CORES...

ADMIREZ CC-240, newly developed in ADM's Resin Research Laboratory, utilizes a cold coating process. It is a dry powdered product containing a cure catalyst which promotes rapid transformation of the resin from a low-melting-point, alcohol-soluble material to a hard, infusible solid under the influence of heated air.

Two basic improvements are offered by ADMIREZ CC-240 over earlier resins: elimination of sand-resin segregation; reduction of economically prohibitive high resin requirements. Advantages are: fast coating; quick breakdown during mulling; high flowability of coated sand; exceptionally fast cure time; excellent stripping from pattern; high tensile strength and lack of brittleness; low-shell breakage; lack of thermal plasticity.

2191 WEST 110TH STREET • CLEVELAND 2, OHIO

Now included in the Archer Quality Line...

SAN-BLO CORE BLOWER . . . WHIRLMIX SAND MIXERS
FEDERAL GREEN BOND BENTONITE . . . FEDERAL SAND STABILIZER
CROWN HILL SEA COAL . . . and a COMPLETE LINE of FOUNDRY FACINGS

Circle 554 on Page 51

Gentlemen, I am interested in trying:

Check One

ADMIREZ CC-240 . ☐
LIN-O-SET II . . . . ☐
ADCOSIL F . . . . ☐
ADCOSIL NF . . . . ☐
ADCOSIL SC . . . . ☐

ARCHER-DANIELS-MIDLAND COMPANY
Federal Foundry Supply Div.
2191 West 110th Street
Cleveland 2, Ohio

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

FOUNDRY

A PENTON PUBLICATION

December 1957

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(For addresses of branch offices, see Page 243)

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FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions, consultants, and research institutions where a direct foundry industry relationship exists.

Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly and copyright 1957 by the Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

SAN-BLO...“MAJOR FACTOR

HOW ARE YOU FIXED FOR CORE BLOWING?

Can your present machines blow heavy oil sand, resin sand or regular molding sand — *efficiently?* Can they blow CO_2 sand with *correct permeability?*

SAN-BLO CORE BLOWERS CAN!

IN REDUCING OUR CORE COSTS!"

LEBANON STEEL FOUNDRY
Stainless, Special Alloy and Carbon Steel Castings
LEBANON, PENNA.
"in the Lebanon Valley"

W.H.WORRILOW *President*
T.S.QUINN *Treasurer*

San-Blo
4600 East 71st St.
Cleveland 5, Ohio

Attention: Mr. George E. Miller
Sales Manager

NO CLAIMS FOR DAMAGES, LABOR OR OTHER CHARGES ON MATERIAL FURNISHED WILL BE ALLOWED UNLESS AUTHORIZED IN WRITING
WE SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER
ALL AGREEMENTS ARE CONTINGENT UPON STRIKES, ACCIDENTS OR OTHER CAUSES BEYOND OUR CONTROL

Dear Mr. Miller:

The use of SAN-BLO core blowers, in conjunction with a dielectric oven for subsequent and immediate baking of blown cores, is a natural and has worked wonders for us. The photograph of our installation, showing the arrangement of the two pieces of equipment, definitely points out the simplicity of the arrangement -- the oven just about keeping abreast of the core blowers, when operating at full capacity.

Incidently, this arrangement has enabled us to produce a 30# core at a rate increase from about 525 pieces per turn to 800 pieces--with less handling, less scrap, truer dimensions and in the mold in quicker time.

Needless to say, it simply means this: All that we did here was to allow the SAN-BLO machines to go full blast, eliminating delays due to handling and baking of the blown cores. Our two SAN-BLO units definitely have been a major factor in reducing our core costs, to the point where our only concern today is: "What else can we blow on our SAN-BLO's?"

Incidently, thanks to you and to your personnel for your part in our story.

Very truly yours,
LEBANON STEEL FOUNDRY
Philip A. Repino
Plant Engineer

PAR:je

Circle 554 on Page 51

MEMBER FEMA

• SAN-BLO sales engineers will welcome an opportunity to analyze your requirements —so you can increase the efficiency of your core room. Please forward your request to our Cleveland Office.

San-Blo Department

Archer-Daniels-Midland company

2191 WEST 110TH STREET • CLEVELAND 2, OHIO

Archer QUALITY

B.F.Goodrich report:

Too hot to handle but it travels on rubber

B.F.Goodrich improvements in rubber brought extra savings

Problem: That fog you see is a cloud of smoke and steam rising from sizzling hot sand on conveyor belt in a foundry. The sand is a scorching 300 degrees—so hot it was ruining belts in a few months.

What was done: When a B.F.Goodrich distributor heard of the problem, he recommended a new conveyor belt called Solarflex. This belt, designed by B.F.Goodrich engineers, is made of a special rubber that stays soft and pliable at temperatures that cause other belts to harden, crack and finally break down.

Savings: The B.F.Goodrich hot-material belt you see here had lasted 30 per cent longer than the previous belt when the picture was taken. It had performed for 9 months — old age for a belt working 16 hours a day, 5 days a week, hauling 60 tons of hot sand an hour.

Extra benefits: Because the B.F.Goodrich Solarflex belt stays flexible even when exposed to high heat, it not only lasts longer than other hot-material belts, but also reduces maintenance costs because it holds fasteners better.

Where to buy: Your B.F.Goodrich distributor has full information on the conveyor belt described here. And, as a factory-trained specialist in rubber products, he *can* answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Company, Dept. M-179, Akron 18, Ohio.*

B.F.Goodrich

INDUSTRIAL PRODUCTS

Circle 555 on Page 51

"We have been well pleased..."

writes a foremost manufacturer about the metal-melting protection of Norton refractories

High melting, long-lasting ALUNDUM*, CRYSTOLON*, MAGNORITE*, FUSED STABILIZED ZIRCONIA and other Norton refractory materials are Norton Rx's — *engineered and prescribed* for longer, lower cost service across the range of furnace applications.

For Rx's that will help you maintain hot metal schedules and reduce shutdowns in your own processing, call in your Norton Refractories Engineer. Or write to NORTON COMPANY, Refractories Division, 311 New Bond St., Worcester 6, Mass.

NORTON
REFRACTORIES
Engineered... Rx ...Prescribed

Making better products...
to make your products better

NORTON PRODUCTS
Abrasives • Grinding Wheels
Grinding Machines • Refractories
BEHR-MANNING DIVISION
Coated Abrasives • Sharpening Stones
Behr-cat Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

VACUUM METALS CORPORATION
DIVISION OF CRUCIBLE STEEL COMPANY OF AMERICA
P. O. BOX 977 SYRACUSE 1, N. Y.
SYRACUSE 8-2371

March 27, 1957

Norton Company
Worcester 6
Massachusetts

Gentlemen:

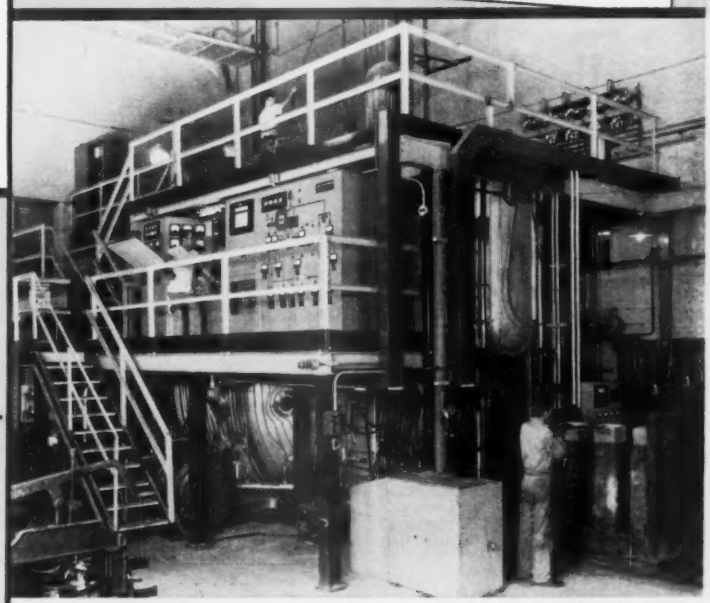
I am enclosing a general view of our newest vacuum melting furnace and a view of the crucible during a melt. This furnace is the largest high vacuum induction furnace in the country and has a capacity of 3000 pounds per heat.

We have successfully used a Norton ramming mix for rammed linings in this and in our 700 pound furnace. Your prefired shapes of Magnorite and Alundum have been used for pouring lips and pouring tubes. Your refractory ramming mixes have been used as a backing for Norton Magnorite and Alundum crucibles in laboratory furnaces for nearly ten years. We have been well pleased with the quality and performance of your products.

Very truly yours,

A. E. Franks
Division Superintendent

AEF/a
cc: Michael Stumm



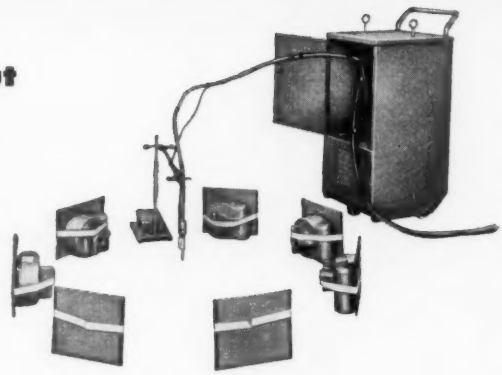
Largest of all high vacuum induction furnaces in the U.S. The accompanying letter from Vacuum Metals Corporation, a Division of Crucible Steel Company, describes how Norton refractory cements and prefired shapes aid in the advanced performance of this huge, modern metal-melting equipment.

Circle 556 on Page 51

some people have queer notions about

RADIOGRAPHY WITH ISOTOPES

Many a plant, uneasily aware that it is missing the profits of radiographic inspection, still holds back for one mistaken "reason" or another. Here are some we run into...



Here's a typical multiple-specimen setup . . . seven castings radiographed simultaneously with a T.O. model 402 panoramic Cobalt 60 unit.

"out of my league"... *costs too much*

Not so. An iridium 192 machine costing as little as $1700 may be fully adequate to your needs. *Indeed, average equipment cost is less than $2500.*

needs a *specialist* to run

On the contrary, a practical on-the-job training course in our Cleveland laboratory (free tuition to buyers) equips any intelligent employee with all he has to know.

takes forever to make a radiograph

Not so. You can x-ray 1" steel in 30 seconds, 3" sections in 4 minutes with the Cobalt 60 sources available today.

gamma radiographs are no good

Not so. If you use the right source for the right job you'll have no trouble getting the 2% detail sensitivity required by exacting inspection codes.

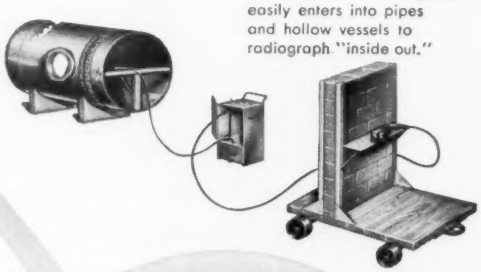
it's dangerous; we're afraid of it

No reason to be: Technical Operations modern equipment is safe and simple-to-handle.

not for me; my stuff is different

We don't know what *your* business is... but if *whatever* you make (or buy or sell) needs "seeing into" for quality control, radiography (either gamma or x-ray) can profit you as it does others — *your competitors included.*

The compact source capsule easily enters into pipes and hollow vessels to radiograph "inside out."



costs nothing to find out

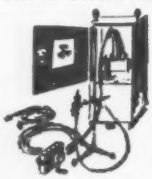
what radiography can do for you. Simply call in your local Picker representative* or write us outlining your problem (and if possible, sending typical samples). We'll make tests and tell you frankly whether radiography holds any promise for you. Because Picker offers *both* x-ray and isotope equipment, we have no axe to grind for any particular method.

There's probably a Picker district office near you (see local 'phone book)

PICKER X RAY CORPORATION
25 South Broadway, White Plains, N. Y

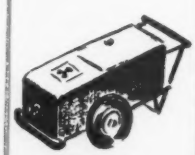
SOME OF THE TECHNICAL OPERATIONS GAMMA RADIOGRAPHY UNITS MARKETED AND SERVICED BY PICKER X-RAY

TO412A
Iridium 192 Unit



TO402
Cobalt 60 Unit

TO404
Cobalt 60 Unit



TO446
Cobalt 60 Unit

TO405
Iridium 192 Unit

TO416
Source Changer

one stop for everything in Picker x-ray **radiography and fluoroscopy**

COLEMAN OVENS

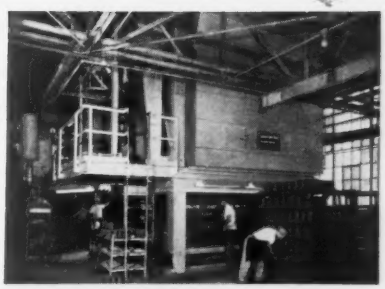
turn minutes into money...

Fast, efficient production of uniformly good cores and molds is vitally important to foundry profits.

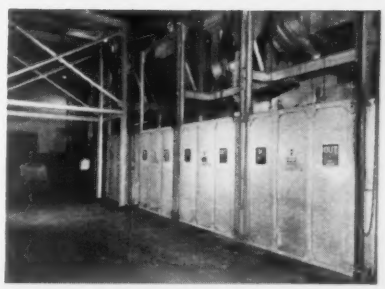
When you use old, out-dated core and mold ovens the minutes and hours lost in costly rejects and make-overs . . . the time and effort lost in wasted man power, the production lost in casting scrap eat your profits away. Modern design and exclusive advantages of Coleman Ovens result in immediate production economies, reducing overall core department costs by as much as 50% ! Such savings mean increased profits and rapid investment amortization.

More than half a century of specialized foundry oven experience is your assurance that the Coleman Oven recommended to you will do your work to your complete satisfaction. ***As builders of the world's only complete line of foundry ovens we have no reason to recommend any but the best for your purpose.*** Let our experienced engineers give you practical suggestions for your particular requirements.

WRITE FOR BULLETIN 54

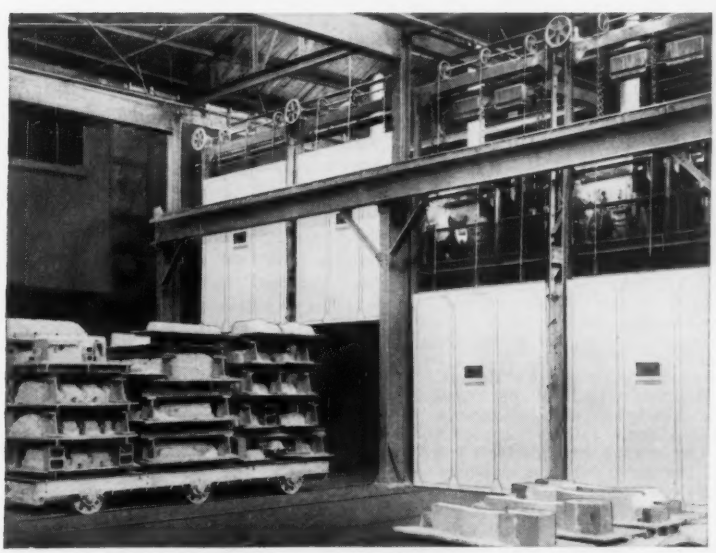


Coleman Tower® Oven



Coleman Transrack Ovens

Coleman Dielectric Oven



Coleman Car-Type Core Ovens

A COMPLETE RANGE OF TYPES AND SIZES . . .
for every core baking and mold drying requirement:

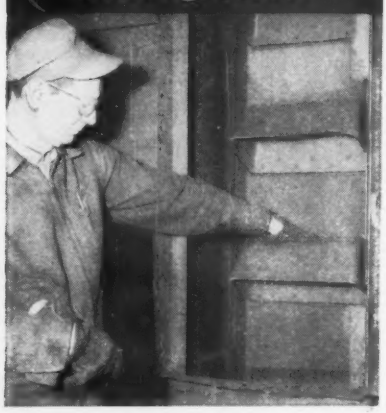
Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens

THE FOUNDRY EQUIPMENT COMPANY
1821 COLUMBUS ROAD **CLEVELAND 13, OHIO**

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

Circle 558 on Page 51

All day, all night lifting sand



Imperial Belt works round the clock moving 400° foundry sand

This Imperial* Sahara* Belt stays scorching hot almost all the time. Operating 24 hours a day at a speed of 258 feet per minute it lifts 400° F. sand in the foundry of Pratt & Letchworth Division of the Dayton Malleable Iron Co., Inc., Buffalo, N. Y.

The belt (90′ of 18″ x 8 ply Standard Sahara Impregnation 935) has been in use more than a year . . . an unusual record under such heat.

Like all Imperial Belts, it is job-designed for specific operating conditions. Special Impregnating compounds toughen every fiber of the heavy-duty duck base fabric and insulate it from heat damage. INNER-LOCKED* stitching permanently prevents ply separation, makes Imperial belts ideal for bucket elevator use.

Imperial Sahara Belting outwears any other belting made for foundry service...gives you lowest ultimate cost.

*Reg. Trademark of Imperial Belting Co.

Imperial

BELTING COMPANY

1755 S. Kilbourn Ave., Chicago 23, Ill.

You expect MORE from Imperial . . . and you get MORE!

Mail this coupon today for NEW Belting Catalog and Engineering Handbook

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_____

Circle 559 on Page 51

With the Editors

A Job for Management: During the last few months, Colin Carmichael, editor of our sister publication *Machine Design*, served as chairman of the judges committee of both the redesign contest of the Gray Iron Founders' Society and the product development contest of the Steel Founders' Society of America. Colin made the awards presentation before each society, and from all reports did an excellent job.

These close contacts with the castings industry may have been the reason he used a foundry to illustrate an editorial on "Management's Responsibility" in the Oct. 17 issue of *Machine Design*. The editorial is so much to the point that all foundrymen should have the opportunity of reading it.

Management's Responsibility

If you apply for admission to a school of business administration, you may be asked such questions as, "What is the purpose of a foundry?" If you answer, "To make castings," you flunk.

A man with good management potential knows, of course, that the purpose of a foundry is to make money.

First reaction to such a seemingly hard-boiled attitude might be, "How greedy can you get?" But sober reflection leads to the conclusion that the man is right.

Money is the yardstick by which much that we value is measured. And so long as we don't fall in love with the yardstick instead of with what is being measured, we can keep the concept of money in proper perspective.

The output of a foundry in tons of castings tells us little about its contribution to human progress. But sales dollars and profit give a measure we can recognize and interpret in terms of benefits to owners and employees.

Boss Kettering goes a step further and speaks of the double profit system. In his view the customer should profit equally with the seller from any business transaction. Any other system is no better than a racket.

An engineer is called upon to apply his thoughts and energies to ideas and things, rather than to people and money which are the province of management. His experience therefore has conditioned him to look upon a foundry primarily as a place where things are made—and an engineering department as a place where ideas are translated into things.

It should never be forgotten that even the most benevolent and altruistic management—in foundries and everywhere else—is solidly dedicated and committed to making money. The most successful managements are the ones that make the most money for the most people.

An engineer's value to his company, of course, is proportional to his alignment with that viewpoint. So is his effectiveness as a professional serving the public.

—o—

Make Them Get Together: Much has been written on the fact that Russia's Sputnik I and Sputnik II beat this country to the launching of a space satellite. As costly as this defeat may be from a world propaganda point of view, the cost may be worth the price if the military is forced by Congress and the administration to unite on planning, research, procurement, and in the field. The American taxpayer surely is paying for much that he is not getting. Your protest to your congressman should help.

—o—

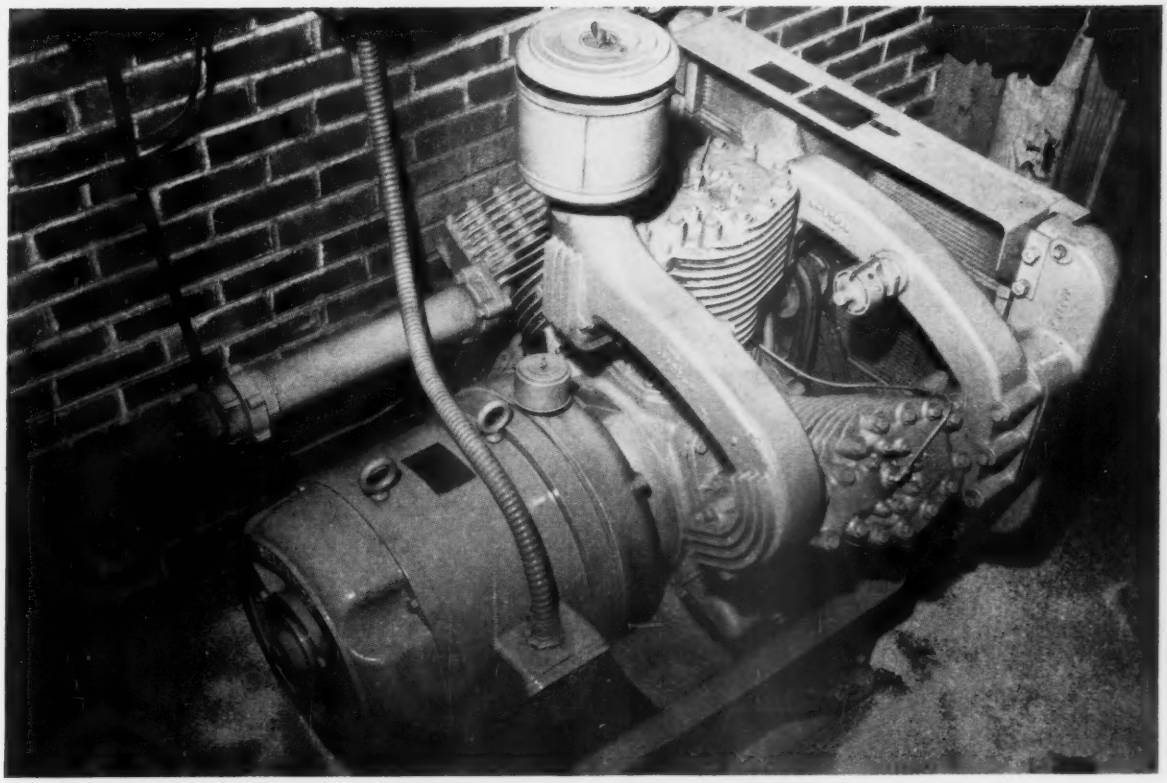
A New Twist: A recent announcement in the monthly program from the Oregon Chapter of the American Foundrymen's Society was a bit unusual. It indicated that the chapter has arranged to provide a television set at each monthly meeting so the members can attend the regular AFS sessions and still see the Wednesday night fight broadcasts. Considering the time zone differential between the East and West Coasts, this arrangement should provide an interesting highlight to the premeeting cocktail hour for our far western friends.

—o—

It Does Apply: Meetings, meetings, meetings! It may be our imagination, but it does seem that 1957 has been a recordbreaker for meetings of foundrymen, and that the fall schedule has been unusually heavy. Ever since Labor Day, the various editors have been on the go, attending regional conferences, chapter meetings, committee meetings, industry meetings, and many others. As a result of this traveling, many reports of meetings have appeared in the past three issues of FOUNDRY, or will be published shortly.

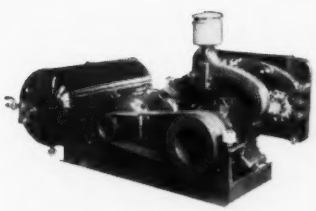
After sitting through session after session and listening to scores of speakers discuss problems covering many phases of castings production and marketing, our editors have formed a few opinions about foundry meetings in general. They agree that while the quality of programs presented at these meetings varies considerably, each does provide information that should be of value to those in attendance.

But we also wonder if foundrymen



SAVE ALMOST A MILE EVERY HOUR IN PISTON WEAR WITH A JOY WL-80 COMPRESSOR—*

** Piston speed is lower than that of four comparable compressors. So low that you save over 6½ miles of wear each 8-hour day.*



Joy WL-80 "Packaged Unit" Compressor can be delivered ready-to go, complete with air receivers, piping and wiring.

NEED A SMALL, COMPACT COMPRESSOR as an auxiliary air supply? Or possibly you want a compressor that can be placed right where the air is used and eliminate long runs of piping.

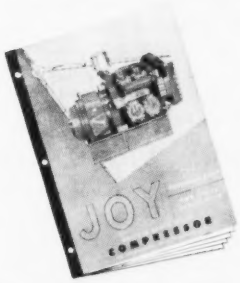
If your requirements call for 640 CFM or less, there's a Joy WL-80 for you:

- *15 to 125 HP.*
- *81 to 641 CFM.*
- *Pressures to 125 psi, standard. (High pressure units to 250 psi).*
- *Single or two stage.*
- *Air cooled.*
- *Force-feed lubrication.*
- *Eleven models.*

. . . And, you have your choice of drives: Direct, V-Belt, Flange-Mounted. In fact, these compressors are available as packaged units, like that shown at the left, delivered complete with air receivers, piping and wiring.

* * *

Get full details by writing for complete information. ● **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



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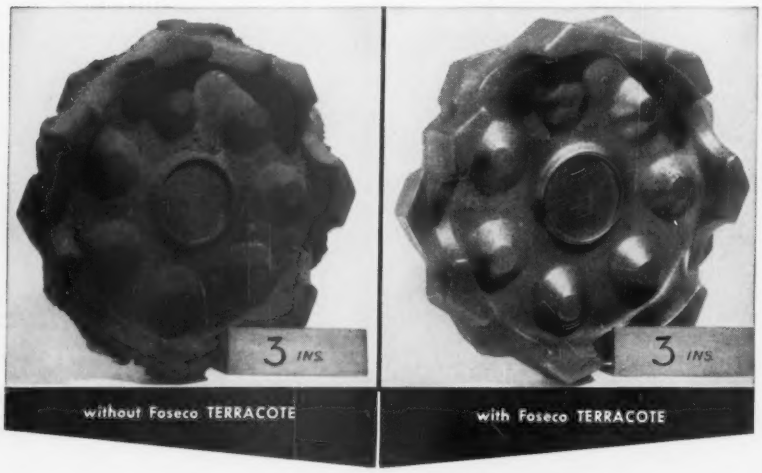
JOY... EQUIPMENT FOR INDUSTRIAL PLANTS... FOR ALL INDUSTRY

Industrial Compressors | Conveyors | Electrical Connectors | Fans and Blowers

Circle 560 on Page 51

Foseco® COATINGS
for better as-cast finish

A smooth, well-finished casting naturally reflects careful foundry practice and greatly increases customer good-will and sales



you can see the difference . . . with Foseco TERRACOTE

Foseco TERRACOTES are ready bonded mold and core coatings for use in producing a smoother, cleaner skin on castings. They can be used on natural or synthetic sand molds and on any type of core sand.

Foseco TERRACOTES come in powder form and may be used as supplied, as a dry coating or mixed with water for dry sand work. Grades are available for iron, magnesium, aluminum, zinc and copper base alloys.

Foseco MOLDCOTE

Foseco MOLDCOTES are spirit-based coatings for application to molds and cores by spraying, painting or swabbing. The spirit base rapidly evaporates or may be burned off from the treated surface, leaving a firm, closely-adhering coating.

Foseco MOLDCOTES are primarily used in green sand work, but you can also obtain excellent results with dry and oil sand molds and cores. MOLDCOTES also produce outstanding results when applied to cores made by the Carbon Dioxide Process. Various grades of MOLDCOTES are available.

Use Foseco Coatings for better *as-cast finish in your foundry. Clip and mail the coupon* now *and we'll send you complete information on Foseco* TERRACOTE *and* MOLDCOTE *explaining how to use them in your foundry.*

FOUNDRY SERVICES, INC.
2000 BRUCK STREET COLUMBUS 7, OHIO
In Canada: FOUNDRY SERVICES (CANADA) LTD., 201-7 Alice St., Guelph, Ontario

Send this coupon for your FREE leaflets giving all the facts on Foseco TERRACOTE and MOLDCOTE.

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Company_____
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City_____ State_____

are really applying the knowledge so readily available at the multiplicity of meetings. Or do too many attend meetings, listen to a speaker, remark that it was a fine talk, full of information, but it does not really apply to their operation.

All of us on FOUNDRY believe that the industry would be able to produce better castings more economically, and that it would have a better sales record if much of the information presented at meetings was studied, weighed, and then applied to the individual foundry's pressing problems.

—o—

Research and Sales: Competition appears to bring problems to every industry. For example, a recent news story from St. Louis reports that Marvin Chandler, president, Northern Illinois Gas Co., told the American Gas Association at its annual convention that the industry must be prepared to open its purse for greater research and sales efforts, or face further losses to electricity.

More research and greater sales efforts also constitute the most important needs of our industry.

—o—

Hard Winter? The 1958 edition of *The Farmer's Almanac,* published by Yankee Inc., Dublin, N. H., arrived a few weeks ago, and as usual, it is filled with interesting information. Abe Weatherwise did not have as much luck with his predictions for the winter of 1956-57 as for the previous year, but his batting average was not too bad. For 1957-58, he says, "Ferly and surly—a real humdinger." I hope he is wrong. For the Cleveland AFS convention and exhibition, May 19-23, he predicts seasonal storms. Could be!

—o—

What the Editor Wants: Do you have the job of preparing news releases for your organization. If you do, perhaps you will be interested in a little booklet entitled "What the Editor Wants." It was published by the Society of Business Magazine Editors, a national organization to which FOUNDRY editors belong.

The booklet gives advice on the characteristics which will improve the chances of the release being used by an editor, how to prepare the release, and other practical answers.

—o—

Season's Greetings: All of the men and women who serve you on the editorial and business staffs of FOUNDRY hope you will have a very merry Christmas and that the New Year may bring more prosperous times to the producers of castings.

F.G.S.

87 OF AMERICA'S "FIRST HUNDRED" CORPORATIONS
ARE WHITING CUSTOMERS

What are the Pro's and Con's of the Water-Cooled Cupola?

A good, pointed question—and one that's been drawing hazy replies since Dr. Gmelin first water-cooled a cupola a half century ago. But there is an answer . . . to this and all other questions that crop up when water cooling is discussed. You'll find them in "Water-Cooled Cupolas," the new full-color bulletin that contains the latest information as compiled by Whiting—the corporation that knows cupolas and cupola problems . . . the supplier whose cupolas melt more than 90% of the iron produced in the USA! Write for two copies today. (One for your file, one to pass around.) Ask for Bulletin FY-176. *Whiting Corporation, 15628 Lathrop Avenue, Harvey, Illinois.*

WHITING FOUNDRY EQUIPMENT

MANUFACTURERS OF CRANES; TRAMBEAM HANDLING SYSTEMS; TRACKMOBILES; FOUNDRY, RAILROAD AND CHEMICAL PROCESSING EQUIPMENT

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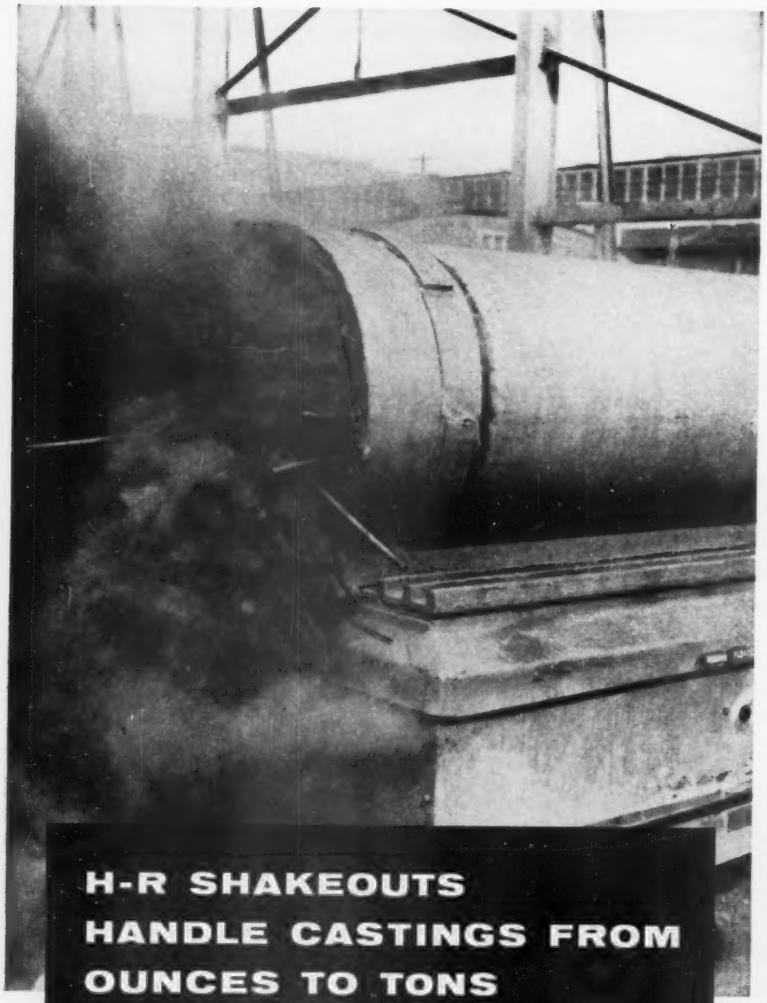

H-R SHAKEOUTS HANDLE CASTINGS FROM OUNCES TO TONS

There is a type of Floatex Shakeout to fit almost any foundry application . . . ferrous or non-ferrous . . . to handle castings from a few ounces to 300 tons. Stroke of each type can be adjusted to improve operation on massive castings, or to protect fragile castings.

These H-R shakeouts also cut time and labor costs. One user saves 12 man-hours per casting . . . another knocks cores out of 400 engine blocks per hour. In addition, where severe noise problems existed, Hewitt-Robins has successfully employed effective methods of noise reduction. To find out how H-R products and services can help you, consult your classified telephone directory for the nearest H-R representative, or contact Hewitt-Robins, Stamford, Connecticut.

HR HEWITT-ROBINS

CONVEYOR BELTING AND IDLERS...POWER TRANSMISSION DRIVES
INDUSTRIAL HOSE...VIBRATING CONVEYORS, SCREENS & SHAKEOUTS

CALENDAR of Meetings

Dec. 3-4—Foundry Facings Manufacturers' Association, annual meeting, Waldorf-Astoria Hotel, New York.

Dec. 4-6—American Institute of Mining, Metallurgical and Petroleum Engineers, electric steel furnace conference, Penn-Sheraton Hotel, Pittsburgh.

Dec. 5-7—National Association of Manufacturers, annual meeting, Waldorf-Astoria Hotel, New York.

1958

Jan. 17—Malleable Founders' Society, semi-annual meeting, Hotel Cleveland, Cleveland.

Jan. 27-28—Industrial Heating Equipment Association, annual meeting, Penn-Sheraton Hotel, Pittsburgh.

Jan. 27-30—Plant Maintenance & Engineering Show, International Amphitheatre, Chicago.

Feb. 6-7—Malleable Founders' Society, technical and operating conference, Wade Park Manor, Cleveland.

Feb. 9-14—American Society for Testing Materials, committee week, Statler Hotel, St. Louis.

Feb. 13-14—Wisconsin Regional Foundry Conference, Hotel Schroeder, Milwaukee.

Feb. 16-20—American Institute of Mining, Metallurgical & Petroleum Engineers, annual meeting, Hotels Statler and Sheraton-McAlpin, New York.

Feb. 18-20—Investment Casting Institute, annual meeting, New York.

Feb. 20-21—Southeastern Regional Foundry Conference, Chattanooga, Tenn.

Mar. 12-13—Foundry Educational Foundation, college-industry conference, Hotel Statler, Cleveland.

Mar. 17-18 — Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

Apr. 21-23—Association of Iron and Steel Engineers, spring conference, Dinkler-Tutwiler Hotel, Birmingham, Ala.

May 1-8—American Society of Tool Engineers, annual meeting and convention, Convention Center, Philadelphia.

May 8-10—American Material Handling Society, western regional material handling show, Great Western Exhibit Center, Los Angeles.

May 12-16—American Society for Metals, 1st Southwestern metal congress and exposition, Automobile Bldg., Dallas, Tex.

May 19-23—American Foundrymen's Society, 62nd annual convention and exhibition, Public Auditorium, Cleveland.

May 21-22—American Iron & Steel Institute, annual meeting, Waldorf-Astoria Hotel, New York.

June 9-11—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

June 9-12—National Materials Handling Exposition, Public Auditorium, Cleveland.

June 9-13—International Automation Exposition and Congress, Coliseum, New York City.

June 22-27—American Society for Testing Materials, annual meeting, Statler and Sheraton-Plaza Hotels, Boston, Mass.

Sept. 22-23—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 23-26—Association of Iron and Steel Engineers, annual meeting, Public Auditorium, Cleveland.

Oct. 8-10—Gray Iron Founders' Society, annual meeting, Sheraton Park Hotel, Washington.

Oct. 16-18—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 18-21—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 27-31—American Society for Metals, national metals exposition and congress, Public Auditorium, Cleveland.

Nov. 10-12—Steel Founder's Society of America, technical and operating conference, Carter Hotel, Cleveland.

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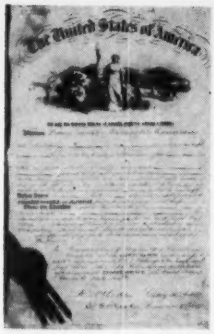

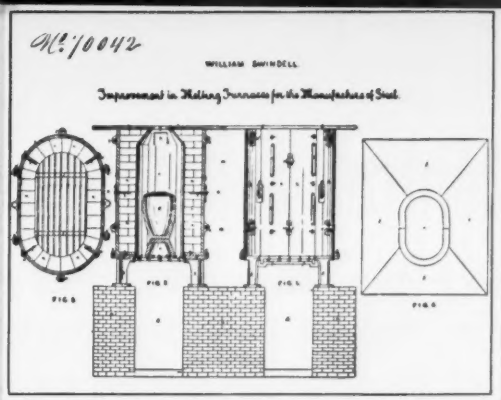

An early patent (No. 70,042 U.S. Patent Office) granted to Mr. William Swindell for an improved crucible furnace, for the melting of steel.

OVER 105 YEARS
... of knowing how

Today's SWINDELL Electric Melting Furnaces, employing the most advanced construction and operating features, reflect in their performance a continuity of steel-melting knowledge and experience extending over 105 years. In fact, a very large American steel producer has been our customer for 103 years. • *Knowing how* is one of the two great qualities in SWINDELL furnace production. The other is integrity. • Let us consult with you.

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ELECTRIC MELTING FURNACES

For Maximum Control and Efficiency . . .

FAST INDIRECT ARC MELTING, ROCKING ACTION PRODUCE CLOSE QUALITY CONTROL AT LOW OPERATING COST

Detroit Electric Furnaces offer three basic advantages for metal melting: Indirect arc heat for uniform high quality; controlled rocking action for maximum heat utilization and homogeneous alloy mixture; and quick shell interchange for economical melting of different alloys.

Close Control of Analysis

By using an indirect arc in a sealed chamber, Detroit Electric Furnaces produce alloys of consistent analysis through heat after heat. Electrodes remain clear of the molten bath at all times. The sealed chamber holds gaseous contamination to a minimum. Melting is rapid, yet final pouring temperature can be duplicated or varied at will.

Double Economy with Rocking Action

Automatic rocking action washes the metal over a greater surface of the lining. This provides fast, efficient metal melting and stirs the bath constantly to assure homogeneity of the metal. Rocking action prolongs lining life by preventing excessive refractory temperatures. The optimum melting cycle for any particular heat can be determined then preset with the rocking controller.

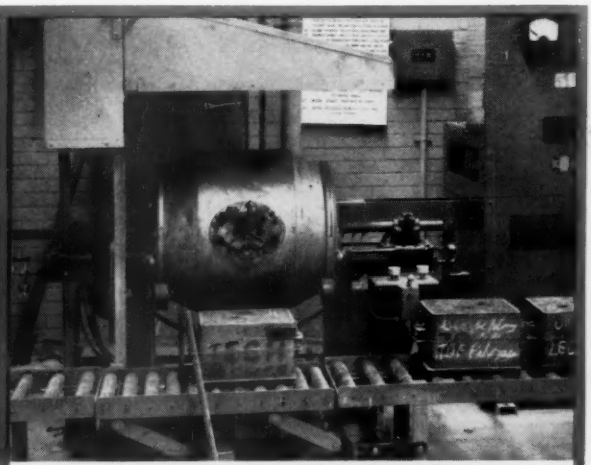
Vary Production Schedules, Melt Different Alloys Easily

Detroit Electric Furnaces are designed to meet diversified melting requirements as well as long run schedules. Using the size furnaces suited to your production volume, a wide range of ferrous and nonferrous alloys can be handled with quickly interchangeable shells. This greatly lowers your initial investment.

Send us your operating data and our engineers will show you how Detroit Electric Furnaces can best meet your needs. Write today, or mail the coupon on the opposite page for full catalog information.

Type AA—1500 lbs. capacity

Produces 5-8 tons of metal per 8-hour shift. Pedestal-mounted electrodes with automatic arc control. Conical or cylindrical shell. 250 k.w. (brass) or 400 k.w. (iron) transformer.



Types GMS/GMT—60/100 lbs. capacity

Ideal for research and limited production. Type GMS-30 k.w. produces 800 lbs. per shift. Type GMT-50 k.w. produces up to 1200 lbs. Base-mounted electrodes. Single transformer and meter cabinet.

DETROIT ELECTRIC FURNACE DIVISION

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Bay City, Michigan

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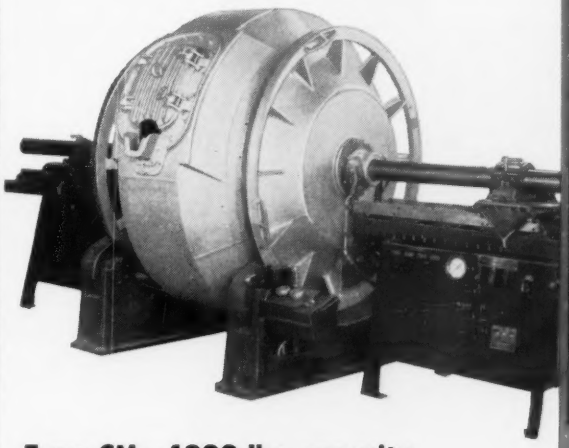
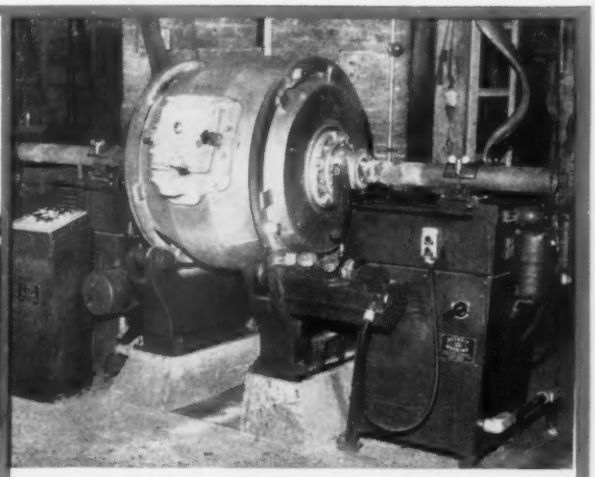
Foreign Representatives: In BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Cornelly, Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

Melt with Detroit ROCKING Electric Furnaces



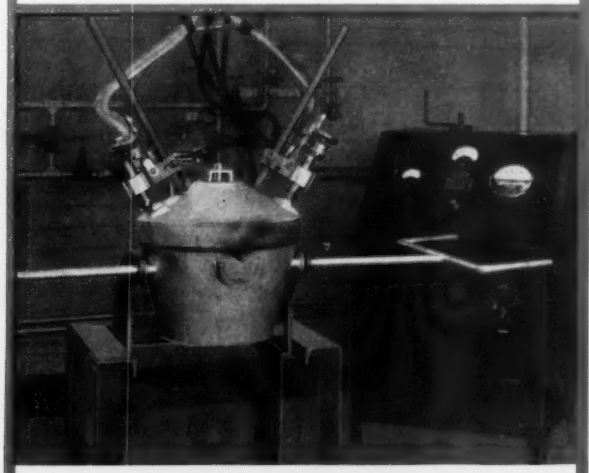
Type CM—4000 lbs. capacity

Produces 10-16 tons of metal per day. Pedestal-mounted electrodes. Conical or cylindrical shell. 400 k.w. (brass), 600 k.w. or 750 k.w. (iron) transformers. Also available: Type CC, 3000 lbs. capacity, rated at 350 k.w. or 600 k.w.



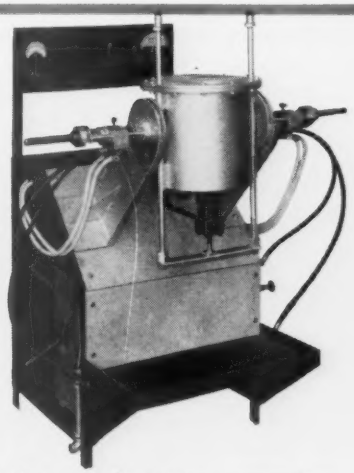
Type LFNP—500 lbs. capacity

For 2-4 tons of metal per shift. Pedestal-mounted electrodes. Conical shell. 150 k.w. transformer. Also available: Type LF-100 k.w., 200 lbs; Type LFC-125 k.w., 350 lbs; Type LFY-175 k.w., 700 lbs.



Type PT—15 lbs. capacity

Pot-tilting type for research and small production. Electrodes mounted in cover. Pot doubles as crucible. Single power unit has 12 k.w. transformer.



Type IC/ID—10/20 lbs. capacity

Investment casting type for precision castings. Type IC rated at 12 k.w., Type ID at 20 k.w. Furnace inverts to pour into attached mold.

FREE CATALOG

Detach and mail coupon for full information on Detroit Electric Furnaces.

Detroit Electric Furnace Division
Kuhlman Electric Company
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Please send me a copy of your catalog No. 559 plus specific information on the Detroit Electric Furnaces checked at right.

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- ☐ CM
- ☐ LFY
- ☐ GMS
- ☐ PT
- ☐ IC

Circle 565 on Page 51

One TOOL DOES THE WORK OF Two!

CP Air-Saw CUTS and FILES...

Stainless Steel, Nickel, Copper, Aluminum, Iron, Steel, Brass, Plastics, Plexiglass, Fiberglas, Porcelain, Formica, Corrugated Transite Sheeting, Wood, Plywood, Hard Fibre, Wall Board, Masonite.

Use it as a saw or a file on heavy-duty production line work. Fit it with a blade and it becomes a utility saw capable of cutting practically every material and every possible shape . . . steel blade stock from your all-purpose band saw can be used for special applications. Add a file chuck and use it with round or flat shank files. Conversion takes 60 seconds. Designed with Variable Speed Control, its cutting action can be regulated to suit your work conditions. For details, write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

Examples of its thousand-and-one uses

1. **In Receiving and Shipping** — opening wooden boxes and crates.
2. **In the Shop** — cutting thin gauge metal without warpage.
3. **In the Foundry** — deburring castings.
4. **In the Automotive field** — installing car heaters, radios and "extra" items.
5. **In the Electrical field** — armature undercutting, cutting coils out of electric motors, filing burrs from stator slots.
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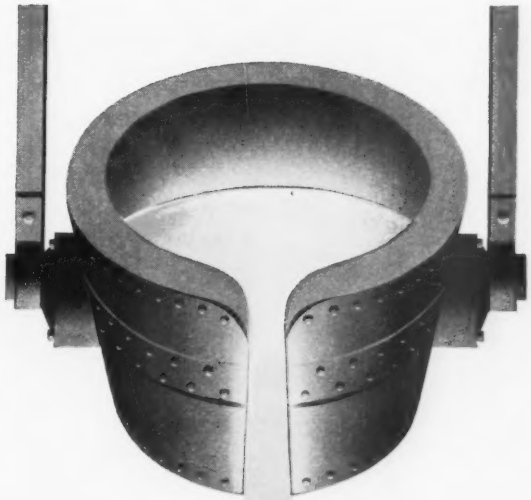
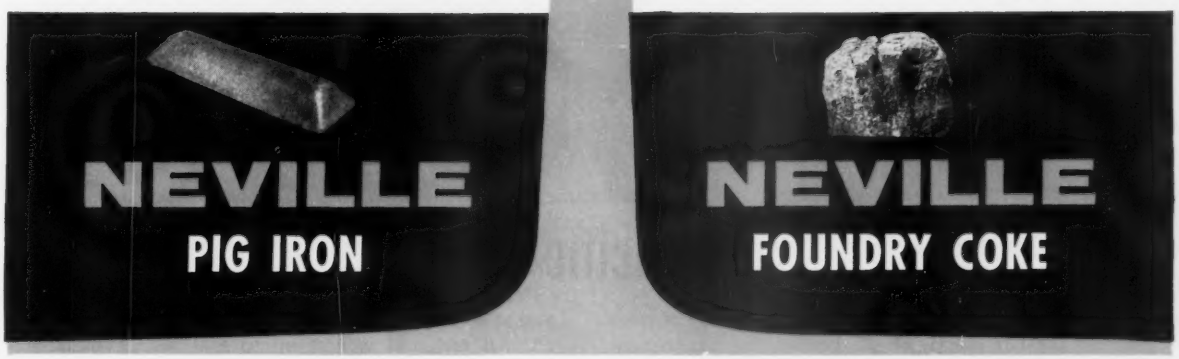


Quality Products for the Foundry Trade



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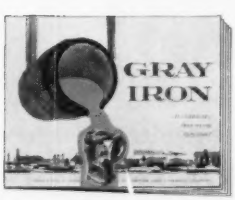
GRAY IRON BROCHURE



An illustrated brochure on the Gray Iron Industry and its place in the nation's industrial economy. Includes descriptive data on casting practices and the story of the production of Neville Pig Iron and Neville Foundry Coke.

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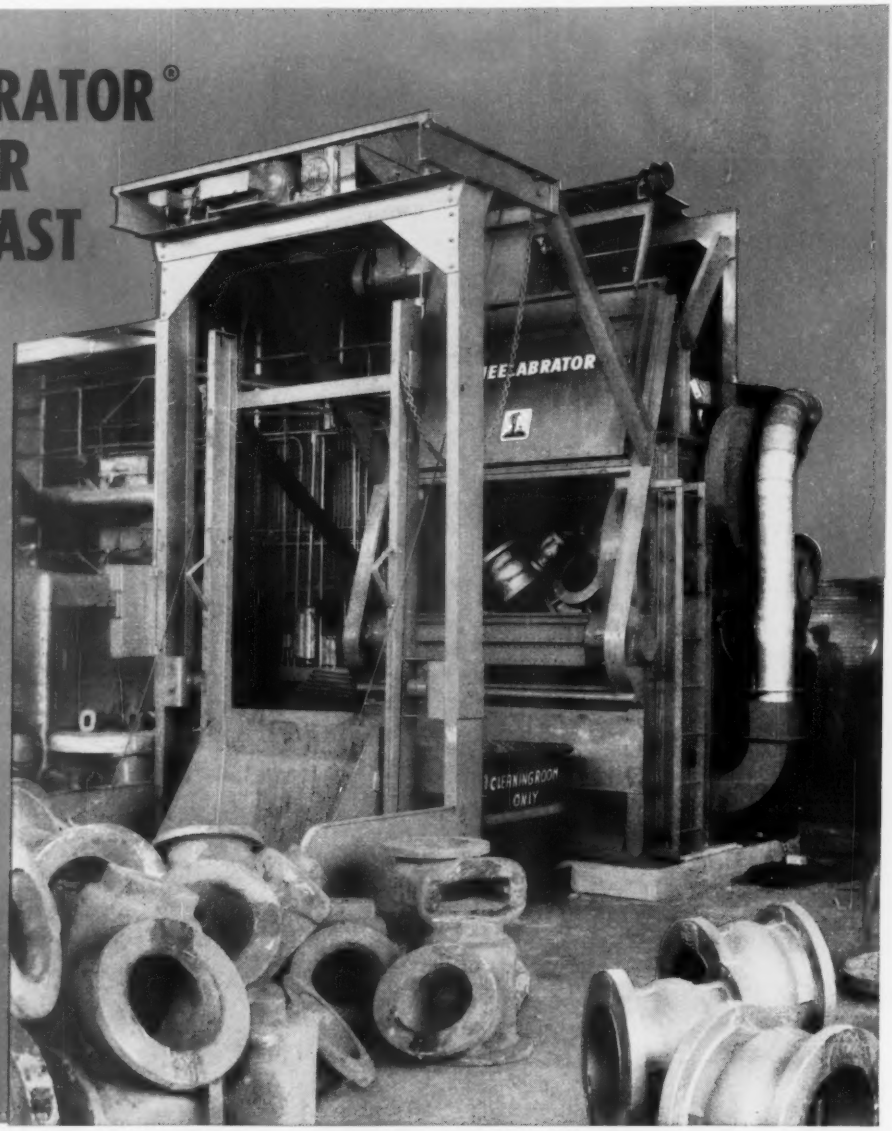
WHEELABRATOR® SUPER TUMBLAST

Saves labor

Saves maintenance

Saves time



Super Savings for Pacific-Southern Foundries, Inc.

Labor requirements slashed three men daily! Cleaning time drastically reduced! Cleaning department geared to production requirements! These are some of the super savings Pacific-Southern Foundries, Inc., Bakersfield, California, obtained with the installation of a 28 cu. ft. Wheelabrator Super Tumblast for cleaning cast steel high-pressure valve bodies and parts.

Cleaning approximately 70 tons of steel castings per day, the Super Tumblast handles the bulk of all cleaning—about 60%—faster, more efficiently and at less cost than by previous methods. Castings cleaned range in weight up to 800 lbs. Typical loads weigh approximately 3000 pounds. In eight months time — 1618 wheel hours — maintenance required has been even lower than expected!

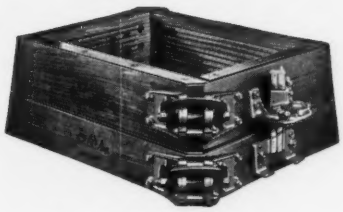
This super-performance is typical of that obtained by all kinds of foundries with the Super Tumblast. Available in three sizes, the Super Tumblast can make similar savings for you. Write today for complete information.

WHEELABRATOR
CORPORATION
505 South Byrkit Street, Mishawaka, Indiana

World's Largest Manufacturer of Airless Blast Cleaning Equipment

Circle 568 on Page 51

LARGE OR SMALL



Patent No. 2393200
Other Patents Pending

ADAMS CHERRY
EASY-OFF FLASK

PIN AND EAR ARRANGEMENT SUPPLIED TO SUIT YOUR PRESENT PATTERN PLATE GUIDES

Write us today for our circulars on Cherry Easy-Off Flasks and Cast Iron or Aluminum Jackets.

ADAMS CHERRY EASY-OFF FLASKS

with ADAMS JACKETS

CAST IRON OR ALUMINUM

To Complete

a winning combination

The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

Circle 569 on Page 51

Photo courtesy of Miller Brewing Company, Milwaukee, Wisc.

HERE'S WHAT MILWAUKEE USERS THINK OF THE NEW CLARKLIFT

Beer, Braves and Business (though not necessarily in that order) seem to be the principal ingredients in the formula that boosts Milwaukee to its position of increasing importance in American industry. The nation's third largest consumer of steel, Milwaukee boasts the highest concentration of skilled labor in the country.

This city of craftsmen who are excellent judges of design and engineering, has shown its approval of *Clarklift* by putting it to work in scores of applications throughout the Milwaukee area.

Clarklift, the finest industrial truck ever built by Clark Equipment Company, is the result of thousands of hours of design, engineering and practical testing. Itself an excellent example of superior production craftmanship, the *Clarklift* offers wholly new operating capabilities.

It incorporates new lift speeds, shorter turning radius, better riding qualities. Clutchless driving and simplified controls combine for an ease of handling that's almost unbelieveable in a fork truck.

There's only one way to find out for yourself. Do as several skeptics from Milwaukee did. Ask for a competitive trial *on your own property.*

Watch *Clarklift's* performance. Inspect its design, its excellent serviceability. Just call your local Clark dealer—he's in the Yellow Pages.

CLARK® EQUIPMENT

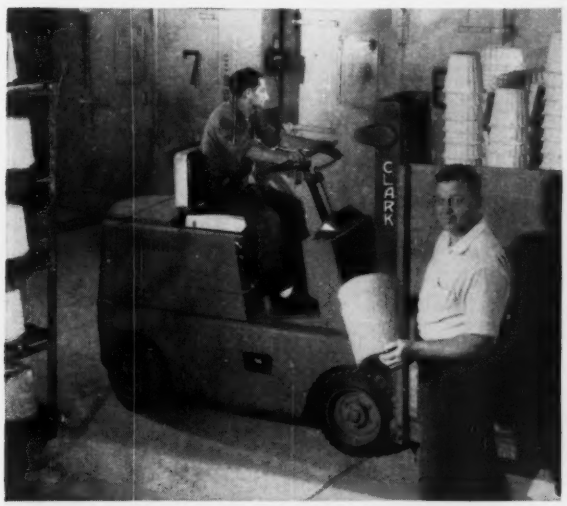
Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek 16, Michigan

CLARKLIFT is a trademark of Clark Equipment Company

(Advertisement)

HARLEY-DAVIDSON MOTOR COMPANY is the proud owner of the first *Clarklift* in the Milwaukee area. Charlie Urban, Maintenance Foreman(right), says, "Harley-Davidson has been using fork trucks for more than eleven years with good results, but this new *Clarklift* is best by every standard."

A. O. SMITH CORPORATION—This happy driver is Ralph Klumb who is moving pallet loads of welding rods from the warehouse for shipment. Ralph says, "This new *Clarklift* is one of the best things that ever happened to me. Why, I even passed out cigars the day I got it."



KEIDING PAPER PRODUCTS COMPANY—*Clarklift* versatility is teamed up with this versatile manufacturer of paper products. Joseph Geiger, Production Manager says, "We conducted competitive tests of a number of trucks before purchase. On all counts—maintenance, performance, ease of handling, driver acceptance—the *Clarklift* was outstanding."

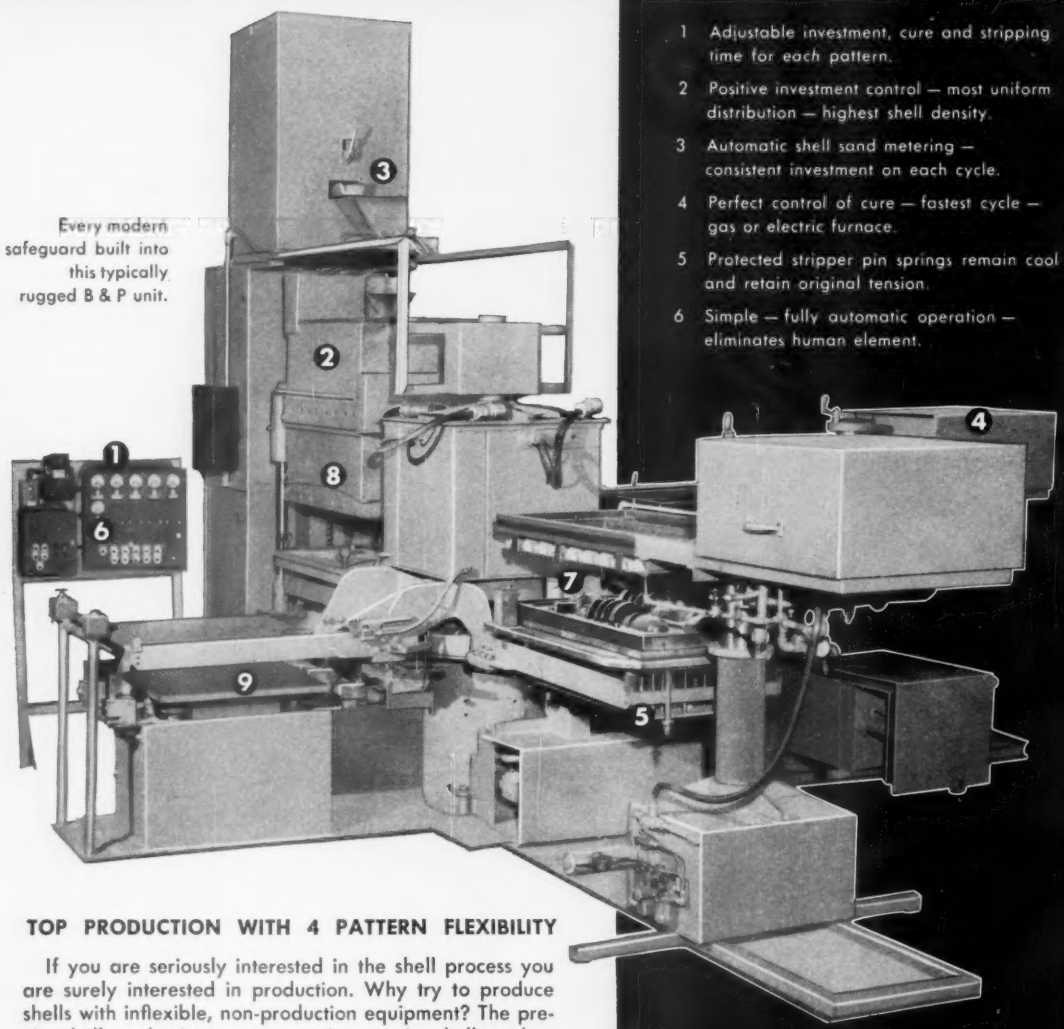
GODFREY COMPANY—This wholesale food distributor moves over 85,000 tons yearly. The new *Clarklift* with the triple-stage upright saves about 35 per cent of the time previously required in stacking the upper half of all racks. And the same truck can enter freight cars and truck bodies with ease, thus eliminating clearance problems.

Circle 570 on Page 51

A PRODUCTION PROCESS REQUIRES PRODUCTION MACHINERY

. . . that means B & P FORMATIC SHELL MOLD UNITS

Every modern safeguard built into this typically rugged B & P unit.



1 Adjustable investment, cure and stripping time for each pattern.

2 Positive investment control — most uniform distribution — highest shell density.

3 Automatic shell sand metering — consistent investment on each cycle.

4 Perfect control of cure — fastest cycle — gas or electric furnace.

5 Protected stripper pin springs remain cool and retain original tension.

6 Simple — fully automatic operation — eliminates human element.

7 Positive automatic thermostatic control for each pattern.

8 Water-cooled jacket — just one of the top-production features.

9 Fastest — smoothest automatic stripping cycle.

TOP PRODUCTION WITH 4 PATTERN FLEXIBILITY

If you are seriously interested in the shell process you are surely interested in production. Why try to produce shells with inflexible, non-production equipment? The precise shell production process requires precise shell production machinery and only the B & P Formatic can really meet that requirement . . . and provide quick-change, four-pattern flexibility with individual pattern control.

In these modern Formatic units, every operation is precise and automatic . . . every step in production is handled by production machinery. You can't afford not to investigate a one-pattern, two-pattern, three-pattern or four-pattern Formatic . . . part of the complete B & P line for shell molding, blowing and sand processing.

Beardsley & Piper, Div. Pettibone Mulliken Corporation, 2424 N. Cicero Avenue, Chicago 39, Illinois.

THE WORLD'S FOREMOST DEVELOPER OF FOUNDRY MACHINERY

What about labor costs for FLASK BUSHING REPLACEMENT?

If you could buy pins and bushings that would hold their accuracy for more hours of rough flask handling—wouldn't it mean a substantial labor saving? Especially if you paid no more for the longer wearing bushing?

We know well how much an accurate, long wearing bushing means to good flask performance. And we assure highest quality in every manufacturing operation, from the selection of the proper steel to the final precision grinding.

Send for our latest catalog which lists the wide range of styles and sizes kept in stock for immediate shipment. We also produce many special pins and bushings which are stocked for the individual users.

Foundrymen know they can depend on Shanafelt for "Everything in Flask Pins and Bushings" as wells as "Everything in Steel Flasks."

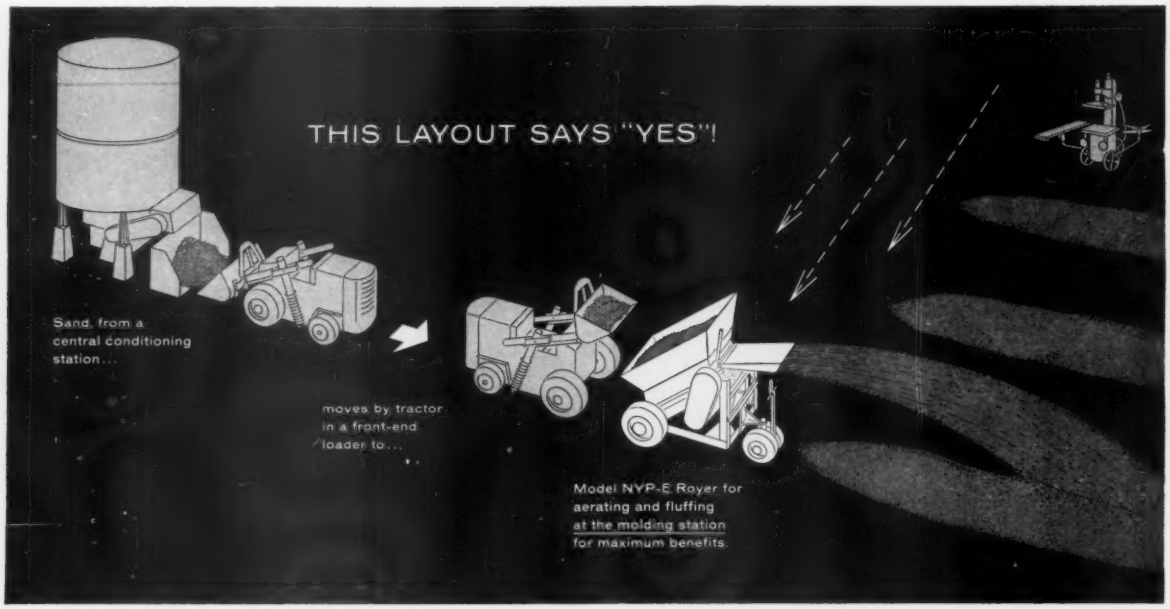
Established 1893

THE SHANAFELT MANUFACTURING CO.

2600-2700 WINFIELD WAY N. E. CANTON, OHIO

Circle 572 on Page 51

ASK YOURSELF... "CAN WE GET BETTER SAND, AND A BETTER SYSTEM, WITH A ROYER?"


THIS LAYOUT SAYS "YES"!
Sand, from a central conditioning station...
moves by tractor in a front-end loader to...
Model NYP-E Royer for aerating and fluffing at the molding station for maximum benefits.

HERE'S HELP FOR YOU

Bulletin NY-54 for complete details and "specs" . . . an experienced Royer engineer to help you work out the system. Either or both for the asking.

Here is a positive cost-cutting sand conditioning system that falls within the budget limitations of the small or medium semi-mechanized foundry. It delivers better sand without adding to time or manpower requirements, and without the expense of complete mechanization. It gains the advantages of fluffing *after* handling, as the final step at the molding station.

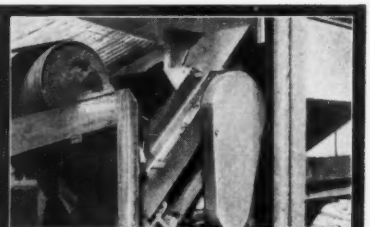
An integral part of this practical system is the Royer Model NYP-E Sand Separator and Blender. It can be moved swiftly from station to station, delivering cooled, aerated, fluffed, perfectly conditioned sand right where it's wanted. With it you can *really* get all the advantages of central system sand control.

Maybe your system "is different." There's a versatile unit of the Royer "NY" Series to fit it . . . and *improve* it. As the photos show, there are stationary models for easy installation at the discharge of a muller or in conveyor systems. But, however you use it, the Royer vastly improves sand, saves time and money, improves yield and quality of castings—all at a *fraction of a cent per ton of sand.*

Note the special literature offer. Write, wire or phone today.

Teamed with front-end loader, a Royer NYP-E Portable moves from floor to floor in a grey iron foundry. What used to be caked, packed sand from mulling, now is a cool, fluffy pile.

"NY" Stationary in a different role—taking direct 1800 lb. discharge of stiff sand from a 9 ft. muller in a steel foundry.



Foundrymen insert versatile "NY" machines into conveyor systems wherever convenient. Result—perfect sand . . . no time hold-up.

Foundry-wise agents throughout the U. S.

EXPORT DEPT.
10406 South Western Ave.
Chicago 43, Ill.

IN CANADA
Brown Engineering Corp.
15 Alcorn Ave., Toronto, Ont.

ROYER

ROYER FOUNDRY & MACHINE CO.

159 PRINGLE STREET / KINGSTON, PENNA.

FOREMOST IN SAND CONDITIONING EQUIPMENT

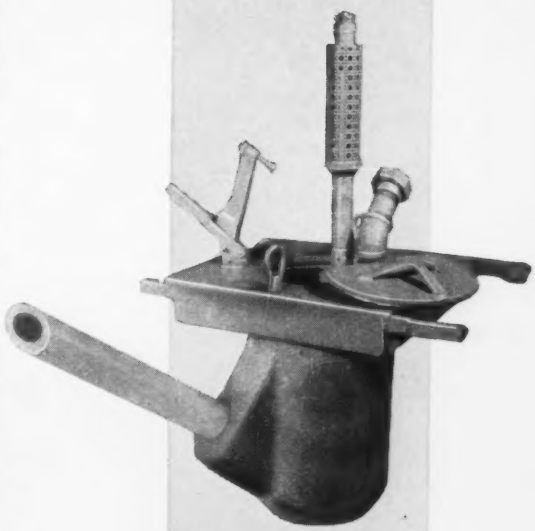
If you apply heat to aluminum LINDBERG can show you the better way

Lindberg-Fisher electric resistance melting and holding furnace with Lindberg Autoladle automatic pump.

Heat and aluminum have been Lindberg's twin babies for many years. If the manufacture of your product requires the application of heat to aluminum anywhere along the line we can help you do the job better. For years our engineering and research staff has been creating improved methods and developing more efficient equipment in this field.

Most recent development is the Autoladle (we call it "Little Joe"), the first practical automatic aluminum ladling unit yet devised. Used with Lindberg melting and holding furnaces "Little Joe" (shown at the right) makes automatic casting of aluminum fast, dependable and economical.

Lindberg's Melting Furnace Division makes a wide variety of melting and holding furnaces for aluminum, brass, bronze, tin, zinc, lead and other non-ferrous metals. These include aluminum induction, nose-pouring crucibles, electric resistance holding furnaces and big reverbs. For foundry, permanent mold or die-casting plant, independent or captive, there are Lindberg melting and holding furnaces to fit your requirements. If your problem in this field needs a special solution Lindberg's design staff can find it. Just get in touch with the Lindberg plant or the Lindberg Field Representative in your locality, or write Lindberg-Fisher Division, Lindberg Engineering Company, 2453 West Hubbard St., Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Ave., at Downey, California.



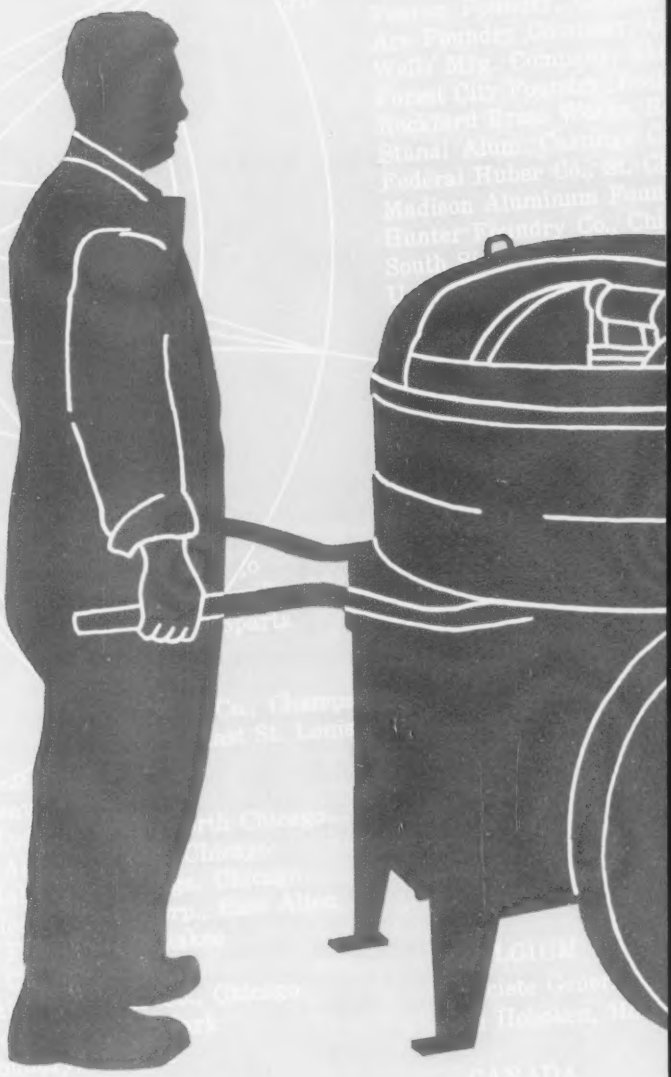
We call it

"LITTLE JOE"

LINDBERG heat for industry

Circle 574 on Page 51

Foundries Everywhere

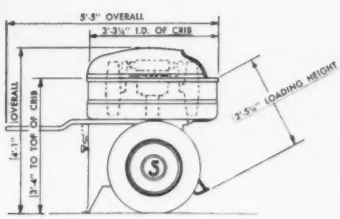


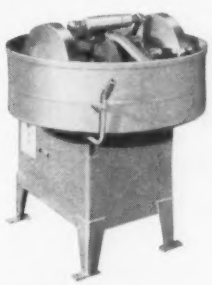
are wheeling SIMPSON *Porto-Muller*® into their Profit Picture

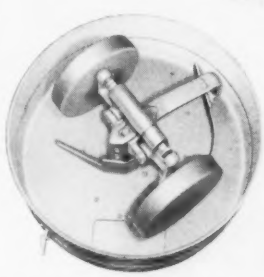
The Simpson Porto-Muller is designed around the fact that it's cheaper and easier to bring the *muller* to small or special mixing jobs, than it is to bring the sand to the muller. That's why it's making real economy possible on hundreds of jobs where makeshift mixing practices formerly took a large toll in wasted core oils and binders. Pioneers in shell, "permanent oil bond" and CO^2 processing have relied on Porto-Muller, too—for dependably uniform blending of small batches.

Got a job for Porto-Muller? Whether it's a big one in a small foundry or a small job in a big foundry, Porto-Muller is a superior mixer on *any* job in *any* foundry . . . and it's a true package unit. You just plug it in and start mixing! No chain hoists or special wheelbarrows are required. It's built to the same high engineering standards that has paired the name Simpson with dependably economical mixing practices for over 40 years.

Write for a specification sheet and a quotation on the low cost Porto-Muller today. Ask for a list of users that are located near you. See for yourself how foundries everywhere are translating Porto-Muller into *profit.*







A PRACTICAL MIXER "PACKAGE". *Porto-Muller incorporates operating, maintenance and construction features comparable to larger Simpson Mix-Mullers.*

AVAILABLE WITH STATIONARY BASE. *Where portability is not a factor, unit can be furnished with sturdy, heavy duty base. Can be anchored to floor or left free for semi-portability.*

POSITIVE CONTROLLED MIXING ACTION. *Spring-loaded mullers permit easy and infinitely variable adjustment of muller pressure—permit use of light mullers, yet you can adjust to mull any sand.*

Circle 575 on Page 51

NATIONAL ENGINEERING COMPANY

646 Machinery Hall Bldg. • Chicago 6, Illinois

ANOTHER Proven Product of a Practical Foundryman

"How is a periodic

Knight Engineering Survey

valuable to management?"

"Through an impartial audit of operations, it points out where and how a foundry can strengthen its competitive position and more fully utilize its manpower and productive capacity."

Knight services include:

Foundry Engineering
Architectural Engineering
Construction Management
Organization
Management
Industrial Engineering
Wage Incentives
Cost Control
Standard Costs
Flexible Budgeting
Production Control
Modernization
Mechanization
Methods
Materials Handling
Automation
Survey of Facilities
Marketing

The rapid pace of improvements in techniques, methods, and machines means a foundry considered modern ten years ago may be out of date today. Drawing on wide experience gained from more than 350 assignments in the foundry field, Knight Engineers are particularly well qualified to know which of the new procedures and equipment are adaptable and can be utilized profitably in a particular foundry. Improved scheduling, proper incentives, an up-to-date cost system are essential to maximum profit today. A Knight Survey can be helpful to your foundry operation. For further information, write or call one of the offices listed below.

EVIDENCE OF EXPERIENCE

Lester B. Knight & Associates, Inc.

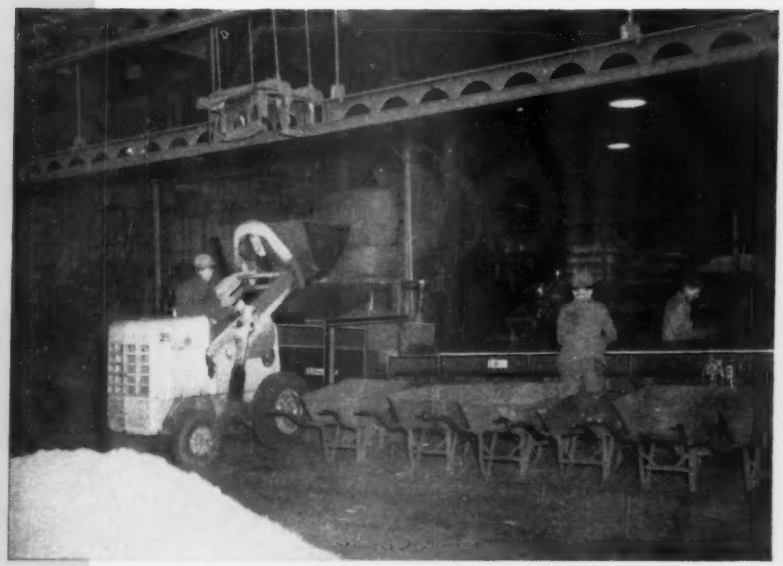
Management, Industrial and Architectural Engineers

Member of the Association of Consulting Management Engineers, Inc.
549 W. Randolph St., Chicago 6, Ill.
917 Fifteenth St., N. W., Washington, D. C.
New York Office—Lester B. Knight & Associates, 375 Fifth Ave., New York City 16
Knight Engineering Establishment (Vaduz), Zurich Branch, Bahnhofstrasse 17, Zurich, Switzerland

Circle 576 on Page 51

OHIO STOVE COMPANY FOUNDRY holds production costs down with SIMPLICITY equipment

At Portsmouth, Ohio, in the modern foundry of the Ohio Stove Co., the SIMPLICITY 4′ x 6′ shakeout and the 30″ x 17′ model VS-12 conveyor (shown here at work) are helping speed operations and reduce unit production costs. First, snap molds are floor dumped; then both castings and sand are scooped and loaded onto the SIMPLICITY shakeout. The castings are then carried on the SIMPLICITY conveyor to the waiting tote boxes. The many plants that are using SIMPLICITY shakeouts are indicative of their foundry-proved superiority. Get complete facts on SIMPLICITY shakeouts, feeders, and conveyors. Write us today.



SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.

FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario

FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N. Y.

190

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND 7, MICHIGAN

Circle 577 on Page 51

How to reduce costs 75%

What makes an HA PAYLOADER® best for your job?

Shortest turning radius
Higher dumping height
Biggest Bucket (18 cu. ft. payload)
Hydraulic load-shock-absorber
40° bucket tip-back at ground level
Exclusive one-lever bucket control

THE FRANK G. HOUGH CO.
703 Sunnyside Avenue • Libertyville, Illinois

Please send "PAYLOADER" information

- ☐ Model HA (2,000 lbs. carry cap.)
- ☐ Model HAH (3,000 lbs. carry cap.)
- ☐ Attachments for scrap handling

Name.....
Title.....
Company.....
Street.....
City.....
State.....
12-A-3

It was only a year ago that Ravena Iron Company Mfgs., Ravena, N. Y. joined the hundreds of foundries that are "PAYLOADER" tractor-shovel users. And like the others, their model HA "PAYLOADER" has already paid a handsome dividend in time and labor savings and in reduced costs. On one clean-up job alone at Ravena it easily does in 2 hours what formerly was a hard 8-hour chore for two men — a reduction of 75% in handling costs. And so it goes on the rest of their sand-handling and general maintenance operations since they mechanized with a "PAYLOADER" at this gray iron foundry.

Foundries of all kinds — big and little — gray iron, steel, malleable and non-ferrous have been joining the ranks of "PAYLOADER" users and boosters for 12 years. And today's model HA "PAYLOADER" is a vast improvement over yesterday's — in productive capacity, digging ability, carrying capacity, carrying speed, in operator ease and safety and in lower maintenance.

Whether your foundry has an old style "PAYLOADER" or *none,* you should have your Hough Distributor demonstrate what a *modern* "PAYLOADER" can do for you. The Frank G. Hough Co., 703 Sunnyside Avenue, Libertyville, Illinois.

SAY "HUFF"

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

Circle 578 on Page 51

Late News

DEFENSE PLANNING: Probably the major problem that has faced this country the last ten years in its defense planning has been the necessity of anticipating advances in technology. This fact was emphasized by Gordon Gray, director, Office of Defense Mobilization, in addressing the recent National Defense Executive Reserve Conference. Some of our industrial expansion which resulted from government incentives contemplated preparation for a war, roughly, of the dimensions of World War II. Our $7 billion stockpile of strategic and critical raw materials also was built upon the experiences of recent wars, but Mr. Gray posed the question, "How relevant is this stockpile in the face of weapons now in being or shortly to be developed?" It has become obvious, he pointed out, that traditional planning must be constantly modernized to anticipate the requirements growing out of new military technology.

CONTROLS: Another change in defense planning is likely to be reflected in pressure on Congress to provide standby economic controls for use in event of an emergency. In the past, preparation of such measures postdated the start of hostilities and resulted in considerable lost time. The Defense Production Act, which expires June 30, 1958, covers what economic controls still exist. Most of the controls enacted at the outset of the Korean War, however, were repealed in 1953. Senator Homer E. Capehart of Indiana, ranking minority member of the Joint Committee on Defense Production, made a strong plea before the Executive Reserve Conference for early action on standby control legislation.

SUPPLIES ADEQUATE: Purchasing agents say that for the first time since the start of World War II, all materials are in adequate supply. This circumstance, a big factor in recent inventory reductions and lack of forward buying, highlights the business survey report just issued by the National Association of Purchasing Agents.

November business conditions were reported practically unchanged from those of October. Better production was indicated by 20 per cent of the purchasing agents and 29 per cent said it was worse. New orders are reported as up by 24 per cent and lower by 30 per cent. The present slowing down in the inflation spiral is expected to continue into 1958. Some wage increases, but less than in 1957, are looked for next year.

SCRAP MARKS TIME: Absence of strength in the iron and steel scrap market matches the lack of vigor in steelmaking and ferrous casting operations. Prices have settled almost without interruption since June. The slump has erased 40 per cent of the midyear value of heavy melting steel and about 25 per cent from cast scrap prices.

PERSONALS: Stanley S. Davies has been elected president of Royer Foundry & Machine Co., Kingston, Pa., succeeding the late S. B. Davies . . . William C. Miller has been appointed sales manager of National Precision Casting Corp., Paoli, Pa. . . . Harold A. Muttach, formerly divisional superintendent of coke ovens, blast furnaces, open-hearth furnaces, and foundry, Granite City Steel Co., Granite City, Ill., has been named works manager . . . Richard H. Thompson has been appointed manager-foundry sales, Climax Molybdenum Co., New York . . . E. F. Mitchell has become vice president and general manager, Vitrified Wheel Co., Westfield, Mass. . . . Donald D. Bowman and Arnold Rogers have been elected vice presidents of Almont Mfg. Co., Imlay City, Mich. Mr. Bowman will serve as general manager and Mr. Rogers as foundry manager.

OBITUARY: Christian Birnbaum, 89, president, Cleveland Standard Pattern Works, Diebold Products Co., and Ohio Piston Co., died Sept. 20 . . . William P. Myers, 56, vice president, Induction Steel Castings Co., East Detroit, Mich., died Oct. 31 . . . Charles J. P. Hoehn, 80, retired president, former Enterprise Engine & Foundry Corp., San Francisco, now a division of General Metals Corp., San Francisco,

died Sept. 14 . . . Thomas Robins, 89, founder and former chairman of Hewitt-Robins Inc., Stamford, Conn., died Nov. 4 . . . John J. Dowdle III, 39, a vice president of Great Lakes Carbon Corp., New York, died Nov. 11.

MERGERS: Crucible Steel Co. of America has acquired full ownership of Rem-Cru Titanium Inc., Midland, Pa. The latter was organized in 1950 as a joint venture of Remington Arms Co. and Crucible.

American Metal Co. Ltd. and Climax Molybdenum Co. will merge, subject to stockholders' approval. The consolidated company is to be known as American Metal Climax Inc.

NFA ELECTS: These new officers were elected by the National Foundry Association at its recent annual meeting: President, Arthur G. Hall, Nordberg Mfg. Co., Milwaukee; vice president, R. C. S. Potter, Chemung Foundry Corp., Elmira, N. Y.; treasurer, W. G. Greenlee, Greenlee Foundry Co., Chicago. Charles T. Sheehan continues as executive secretary.

ICI OFFICERS: P. W. Schipper, Howard Foundry Co., Investment Casting Div., Milwaukee, was elected president of the Investment Casting Institute at its annual meeting, Nov. 21. Other officers are Robert R. Miller, Precision Metalsmiths Inc., Cleveland, vice president, and William L. Worthen, Bone Engineering Corp., Glendale, Calif., treasurer. Harry P. Dolan continues as executive director of the institute.

MISCELLANY: The new Port Coquitlam, B. C., Canada, alloy steel foundry of Esco Ltd., Vancouver, B. C., will be in production in January, 1958. Esco Ltd. is owned by Electric Steel Foundry Co., Portland, Oreg. . . . General Vacuum Corp., 400 Border St., East Boston, Mass., is a new company in the vacuum melting field. It will concentrate initially on intermediate sizes of special high-vacuum equipment and develop a line of pilot plant induction and arc melting vacuum furnaces . . . The York, Pa., gray iron foundry of York Corp., a division of Borg-Warner Corp., is being liquidated to provide additional manufacturing space to increase production of refrigerating and air conditioning equipment. Liquidation is being handled by AAA Machinery & Equipment Co., Cleveland.

Prices of Foundry Metals and Coke

(As of Nov. 25, 1957)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$18.00-18.50
OVEN	
Birmingham	$28.85
Buffalo	30.50
Detroit	30.50
Erie, Pa.	30.50
Indianapolis	29.75
Kearny, N. J.	29.75
Milwaukee	30.50
Montreal, Que.	31.00
Neville Island (Pittsburgh)	29.25
New England, deld.	31.55
Painesville, O.	30.50
Philadelphia	29.50
St. Louis	31.50
St. Paul	29.75
Swedeland, Pa.	29.50
Terre Haute, Ind.	29.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	67.00	67.50
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 27.25; tin bronze, No. 225, 36.00; No. 245, 30.75; high-leaded tin bronze, No. 305, 31.25; No. 1 yellow, No. 405, 22.75; manganese bronze, No. 421, 24.50.

ALUMINUM: 99 per cent plus primary ingots 28.10. Secondary No. 12 alloy, 21.75-23.00. Deoxidizing grades: No. 1, 23.75, No. 4, 19.00.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 27.00, delivered Connecticut valley.

ZINC: High grade 11.35 delivered. Die casting alloy No. 3, 14.25; No. 2, 15.25, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwised noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$31.00–32.00	$47.00–48.00	.....	.....	.....	.....	$49.00–50.00
Boston*	**23.00–24.00	**28.00–29.00	.....	.....	**35.00–36.00	.....	.....
Buffalo	32.00–33.00	**39.00–40.00	.....	.....	**44.00–45.00	.....	51.00–52.00
Chicago	34.00–35.00	35.00–36.00	.....	40.00–41.00	40.00–41.00	45.00–46.00	49.00–51.00
Cincinnati*	**30.00–31.00	**35.00–36.00	**32.00–33.00	.....	**47.00–48.00	.....	**54.00–55.00
Cleveland	28.00–29.00	38.00–39.00	29.00–30.00	37.00–38.00	40.00–41.00	49.00–50.00	55.00–57.00
Detroit*	**21.00–22.00	**31.00	**24.00	**33.00	.....	**34.00	.....
Los Angeles	39.00	**52.00	.....	.....	.....	.....	.....
New York*	33.50	38.00–39.00	33.00–34.00	.....	.....	.....	.....
Philadelphia	33.50	39.00	38.00	.....	50.00–51.00	57.00	63.00–65.00
Pittsburgh	33.00–34.00	41.00–42.00	.....	44.00–45.00	53.00–54.00	.....	58.00–60.00
St. Louis*	37.00	43.00	35.00	35.00	.....	.....	50.00
San Francisco	36.00	47.00	38.00	47.00	47.00	.....	.....
Seattle	36.00	35.00	32.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

Whitehead's NEW DUO RESIN* BINDER

● with controlled oven temperature you can profit by the advantages of our latest lab development.

After three years of laboratory research and field testing, Whitehead is now ready to supply DUO RESIN Binder to progressive foundries for dry sand molding. It is a laboratory controlled product designed to replace pitch. DUO RESIN Binder affords all the desirable properties of pitch; in addition, it gives a consistently strong bond and offers the following highly desired advantages:

1. **EASY SHAKEOUT** — DUO RESIN Binder makes shakeout easy because it burns out while metal is cooling.
2. **BETTER CASTING FINISH** — Permits full benefit of blacking penetration since it does not waterproof sand.
3. **ECONOMICAL** — Promotes economy by saving up to 50% of dry binder, requiring less handling, less storage, less transportation. Takes lower baking temperatures, saving fuel, too.
4. **SIMPLIFIES OPERATION** — Because it eliminates need of blending with other compounds to achieve the desired results.
5. **NON-IRRITATING** — Of bland chemical composition, DUO RESIN is non-irritating.
6. **TESTED AND PROVED** — It has been tested and proved safe in foundry after foundry.

Try DUO RESIN Binder!
Order a trial quantity today.

***For details ask for literature or consult our representative.*

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence 1, R. I.

Manufacturers of:

LYQUAGRIP
Ready-to-use core paste

DOB-IT
Ready-to-use core mudding compound

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

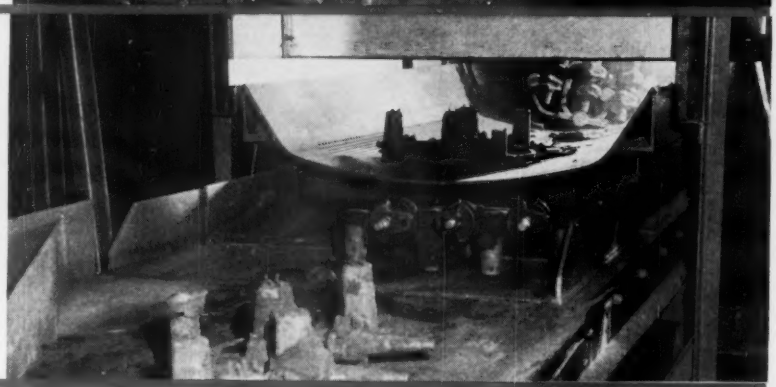
Circle 579 on Page 51

1. COOLING

After the pour, castings, molds and backing sand are automatically discharged from trolley conveyor into this 36-in. wide Torqmount conveyor—first in system of Link-Belt oscillating conveyors. Material travels at 10 fpm to facilitate cooling.

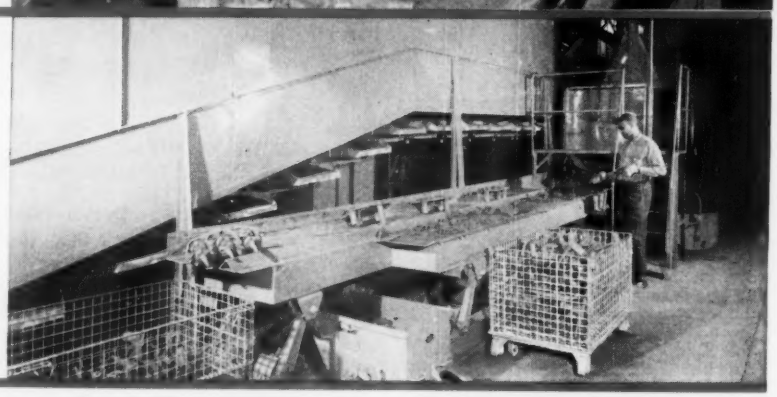
2. SCREENING

This 8-ft. screening section, with ⅜-in. diameter openings, efficiently screens off backing sand and finer particles of mold sand. Lower trough of the conveyor carries the sand to bucket elevator discharging to belt conveyor delivering to storage bin.



3. SORTING

Last 21 ft. of oscillating conveyor system serves as a sorting table. A divider channels the material to one side where it can be easily sorted by one man. Castings and sprues are collected in wire baskets for further cooling, and refuse sand drops into a tote box.



LINK-BELT Torqmount oscillating conveyors unite all 3 in

one continuous sequence

From shakeout to sorting—Link-Belt Torqmount oscillating conveyors provide gentle, continuous handling at this highly mechanized shell mold foundry. Combining *positive action* and *natural frequency*, they move hot castings from the shakeout smoothly through cooling, screening and sorting . . . hold manual labor to a minimum . . . assure safe, clean working conditions.

Link-Belt can add new economy and efficiency to *your* castings production. Whether you need one machine or complete engineering, call your nearest Link-Belt office. *NOW*—36-in. wide oscillating conveyors are available from *STOCK*. Get Book 2423 for full facts on Link-Belt's broad line of foundry equipment.

14.085

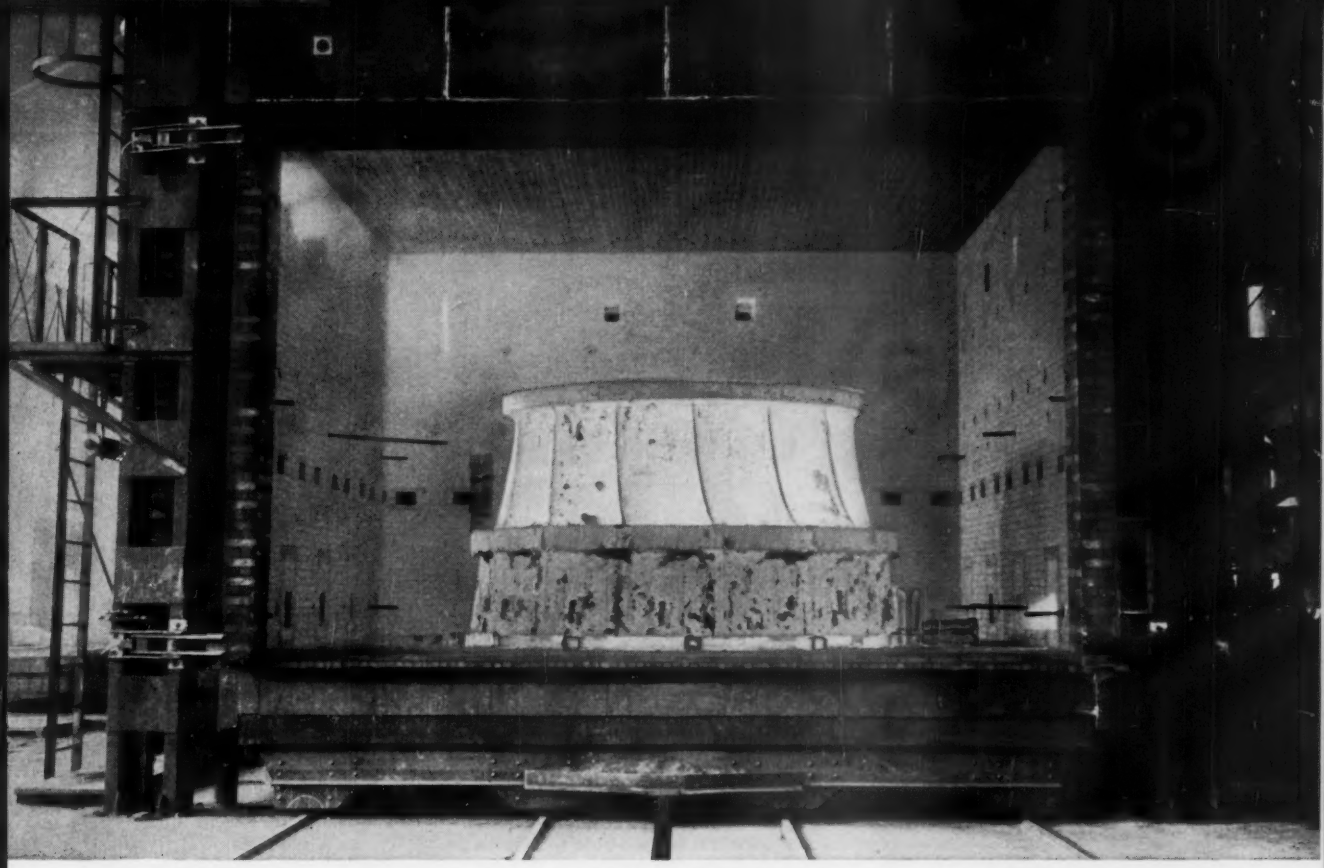
LINK-BELT

OSCILLATING CONVEYORS

MEMBER FEMA

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World.

Circle 580 on Page 51



For best performance and maximum economy

7 different specialized refractories used in annealing furnace lining

Engineering a furnace lining with *specialized* refractories can save dollars on construction, fuel and maintenance as well as extend productive working time. To achieve these results, seven different B&W refractories were used in the lining of this 25′ x 23′ x 14′ annealing furnace.

Fuel savings and close temperature control were made possible by using three types of *lightweight* B&W Insulating Firebrick. Walls are composed of *B&W K-23 IFB* backed up with *B&W K-16*. Because of the proximity of the burners, the roof was constructed of *B&W K-26 IFB*, a higher temperature brick to guard against the effect of possible localized overheating.

The weight saving construction means about 100 lb less refractory material to heat up per sq ft than with ordinary firebrick, or about 28 tons less in the roof of the furnace. Furthermore, supporting steel is less massive, far less costly. Commercial size steel can be used for roof suspension instead of special steels.

To eliminate the need for expensive special shapes, the burner tunnels are formed of *B&W's 3000 F refractory castable, Kaocast*. Lintels over the burners and jambs are constructed of rugged *B&W Junior Firebrick*.

To take advantage of fast, easily installed castable construction, *B&W Kaocrete-D* was used in the nose arch (separately pictured). This sturdy castable with a 2500 F use limit was selected to provide strong resistance to abrasion caused by door operation. In addition, the need for costly fired shapes and their supporting castings was eliminated, as was a great deal of expensive engineering detailing.

Nose arch, cast of B&W Kaocrete D, immediately after removing forms.

The car top is insulated with *B&W Kaolite-20*, a 2000 F insulating refractory concrete.

For further information, write for B&W bulletin R-2-H on insulating firebrick and B&W bulletin R-35 on castables.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42nd ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

R-574

Circle 581 on Page 51

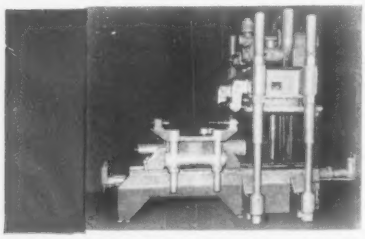
(Advertisement)

Minerals International Chemicals

A REPORT TO FOUNDRIES

Diaphragm Molding Celebrates its Centennial

The above title may be confusing to most of us who consider the Taccone Diaphragm Molding Machine as a very new piece of equipment. Just to prove that there is nothing new under the sun, it was about 100 years ago that the theory of diaphragm molding was first disclosed in the technical literature. This description preceded the first jolt machine by



about five years. If the idea is 100 years old, what happened to it during those last 100 years?

A number of little items have made the difference between success and failure and account for the rapid growth of Taccone Machines in the last few years. In addition, however, there are three major factors which make the difference between 1857 and 1957.

1. *The manufacturers of rubber didn't know as much 100 years ago.*
2. *The principle of the slack diaphragm and its elimination of the necessity for stretching wasn't recognized until Russell Taccone invented it.*
3. *It had previously been assumed that the great force exerted by the diaphragm would have to be confined by clamping the flask to the machine. This meant slow production. The recent R.W. Taccone patents were the first to recognize that a gap could exist between the head of the machine and the flask and as a result, this is now the fastest molding machine instead of the slowest.*

The actual molding cycle with a diaphragm machine as produced today is between one and two seconds. Everything else involved in making the mold revolves around the ability to move the flask into and out of the machine. In larger sizes, this isn't the easiest task in the world but we have succeeded in setting up operations on flasks 36" square and 9" deep with a mold every 14½ seconds complete.

The peculiar thing about the speed of the diaphragm machine is that it is almost independent of size. It is at least theoretically possible to make a mold 30" long, 10" wide and 3" deep in the same length of time provided someone will figure out how to move the flask in and out that fast. Because of the lack of limitation on size, there is a definite tendency today to use multiple molding of patterns and combine various jobs in one larger flask. For example, in the case mentioned above, the standard production set-up for a particular casting was to make one in a mold 16" x 18" for a maximum speed. Today, with the Taccone Diaphragm Machine that same casting is made four in a mold and the speed is actually faster than the single mold was a few years ago. As a result, the old practice had a maximum production per machine of three castings per minute whereas the existing operation is 16 castings per minute.

This is an important point because every machine is limited by its ability to handle flasks in and out. By excellent design of the equipment, it is possible to get up to 200 or even 300 molds per minute but when you start to talk of four times that production, the world comes to an end. However, because of the absence of the size limitation with the Taccone Machine, it is a simple proposition to switch over and make four castings instead of one which then gives you the equivalent of 1000 to 1200 per hour.

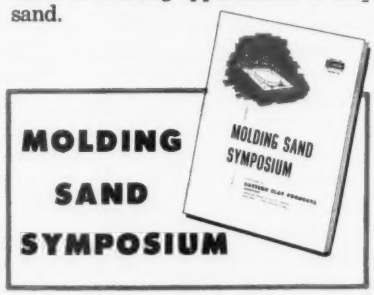
We have one very simple case in which a single Taccone Machine eliminated 11 high speed jolt squeezers although the Taccone Machine is turning out 300 molds per day. We would be happy to tell you the secret.

CO_2 MOLDS

Back in 1956 at Atlantic City, we stuck our neck out on the possibility of making molds combining the CO_2 Process and regular green sand molding. This was demonstrated in our booth with a Taccone Machine. Modern Castings carried an article on it entitled, "Now they are Making CO_2 Shells." Want a reprint?

Since then, we have watched the growth of the CO_2 Process and are pleased to find a number of foundries utilizing this technique to advantage. A New England foundry showed us an operation in which they were having a great deal of difficulty with the drag of an intricate casting. The job was licked by making up a CO_2 facing backed up with a green sand mold. In the cope, the CO_2 was not necessary but the requirements of the drag were such that ordinary green sand wouldn't handle it. They found much advantage in this process as compared with trying ram-up cores or some other more expensive technique.

As exclusive distributors of the Don CO_2 Binder for the CO_2 Process, we can help you with this and other interesting applications of CO_2 sand.



From time to time, our friends ask us where they can get a good book on sand practice. We have one which we would like to send to you as long as the supply lasts: "Molding Sand Symposium." It is a reprint of a series of articles in Foundry magazine in 1954. It covers practical molding sand control, fundamentals of synthetic mold-

ing sand, use of naturally bonded molding sand, molding sand use in the grey iron industry, steel foundry molding sand, steel practice in the malleable foundry, molding sand in the brass foundry, aluminum foundry molding sand use, and magnesium molding sand. Among the top authors represented in this compilation of information is our own Norman J. Dunbeck, long recognized as an international authority on molding sand and today a Vice President of IMC.

pH OF CLAYS

Last month we discussed pH control in clays and promised to report on the pH characteristics of the types of clays you and we work with.

Revivo Bond. This is the oldest of the fire clay type bonds and carries a pH of approximately 5.0. This clay is the closest to the pH of most of the natural sands. When added as a method of reviving the strength of natural sands, it most closely approximates the original condition. As with a naturally bonded sand, this type of clay, being a low pH, maintains a high durability and maximum cushioning against scabs and buckles.

Dixie Bond. This is the original southern bentonite. For years, it was available only with a pH of approximately 6.0. It worked very well with naturally bonded sands because of its low pH and was considered ideal for additions to heap sands. It is the strongest of the bond clays when used in this condition. Recently, we have introduced a second grade of Dixie Bond which we call the high pH Dixie. This is never shipped unless specified by the customer. The high pH grade carries a pH of approximately 8.0 or just slightly on the basic side. On the average, it tends to be slightly weaker than the lower pH southern bentonite but is of particular advantage where the higher pH is required. High pH Dixie Bond is recommended for slurry operations where both southern and western bentonite are combined in the same slurry. Under these conditions, this bentonite gives the lowest viscosity slurry; we sometimes refer to it as low viscosity Dixie Bond. There is no difference in price in these two grades and either can be obtained by specifying the type best suited to your requirements. Remember, only the low pH southern is shipped when no specification is placed on the order.

Black Hills Western Bentonite. Our western bentonite operates at approximately 9.0 pH. As such, it is the most basic of the bond clays and provides the highest dry and hot strength properties along with green strengths only slightly less than those of southern bentonite.

BENTONITE IS BENTONITE

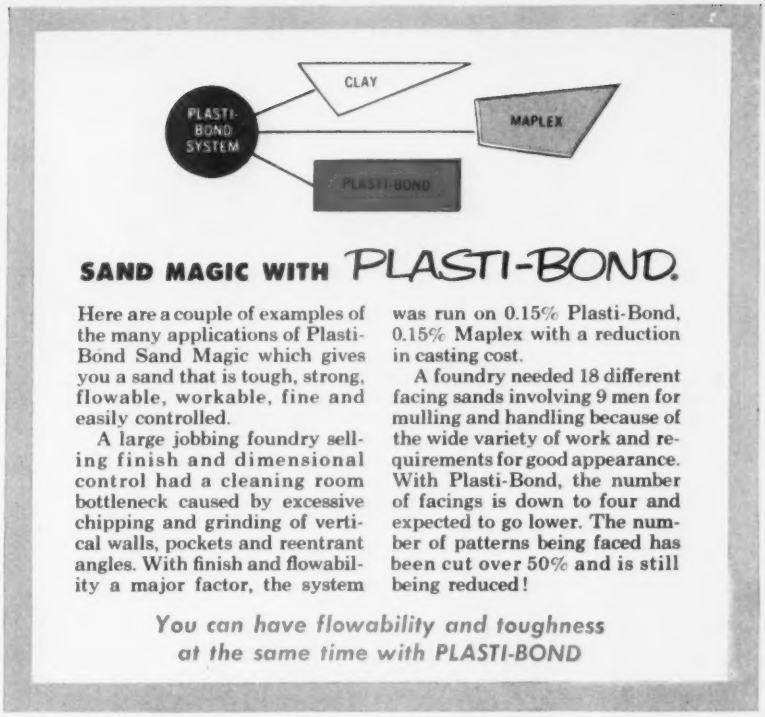
How often do you hear the statement that bentonite is bentonite or that it all comes out of the same hole in the ground? We would like you to know why this is not universally true.

In one sense of the word, this fallacious statement may seem to be true. It probably gives that impression to the man who first sees the area around the Black Hills. He looks out across the plains and sees miles of nothing but miles and miles. Underneath most of this country is some form of bentonite, laid down by volcanic action millions of years ago. The clay in this area varies all the way from junk which nobody would buy to the best montmorillonite clay. The good bentonite comes from the company that has sufficient resources to control miles and miles of this nothing but miles and miles, so that they can pick and choose their clay with an eye only to quality.

After the geologist goes over the ground carefully and decides which clays are adequate, the mining crews must dig only that portion which is recommended by the geologist. Quality bentonite comes from quality selection and quality supervision.

After the clay is mined, it is brought back to the plant for crushing and drying. The manufacturer, if he has sufficient facilities, can blend carefully to get maximum uniformity and maximum quality. There is also an opportunity at this point to ruin perfectly good clay by improper equipment or improper use of the equipment.

Our quality control of selection, mining, blending and curing assures you of top quality at all times.



SAND MAGIC WITH PLASTI-BOND.

Here are a couple of examples of the many applications of Plasti-Bond Sand Magic which gives you a sand that is tough, strong, flowable, workable, fine and easily controlled.

A large jobbing foundry selling finish and dimensional control had a cleaning room bottleneck caused by excessive chipping and grinding of vertical walls, pockets and reentrant angles. With finish and flowability a major factor, the system was run on 0.15% Plasti-Bond, 0.15% Maplex with a reduction in casting cost.

A foundry needed 18 different facing sands involving 9 men for mulling and handling because of the wide variety of work and requirements for good appearance. With Plasti-Bond, the number of facings is down to four and expected to go lower. The number of patterns being faced has been cut over 50% and is still being reduced!

You can have flowability and toughness at the same time with PLASTI-BOND

MINERALS International CHEMICALS

EASTERN CLAY PRODUCTS DEPT.

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

20 NORTH WACKER DRIVE, CHICAGO 6 • PHONE: Financial 6-1800

Circle 582 on Page 51

(PATENT APPLIED FOR)

NEW MANHATTAN SAFETY BACK FLARED CUP

Not simply a new safety "feature" . . . not merely a design "improvement." Here's a *totally new concept* of flared cup wheel design *and* construction . . . developed by Manhattan engineers to give the greatest safety and performance advantages possible for flared cup wheel users. Manhattan's revolutionary SAFETY BACK Flared Cup puts portable wheel *safety* where it counts the most—in *original* strength and breakage resistance!

SAFETY BACK makes obsolete ordinary safety features such as anchor bushings, safety rings, special hub mountings, or revolving cup guards. With SAFETY BACK, steel covers the *entire* back of the flared cup . . . extends down the side to offer a degree of reinforcement and breakage resistance never before possible!

NO OTHER WHEEL—AT ANY PRICE—OFFERS THESE EXCLUSIVE FEATURES

- **Greatest Initial Strength**
- **Highest Safety Factor**
- **Easy Mounting—Easy Operation**
- **Improved Mounting Base**
- **One Piece Assembly**
- **Requires No Adjustment**

Only SAFETY BACK gives you these features—*plus* Manhattan's custom-engineered abrasive bond for *faster* removal of *more* metal on your particular job—at no additional cost! For "More Use per Dollar" in portable grinding operations, you can't get a faster cutting, longer lasting—*safer* wheel than MANHATTAN.

Let a Manhattan abrasive wheel engineer show you the advantages of SAFETY BACK Flared Cups, and other types of Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

RM-752

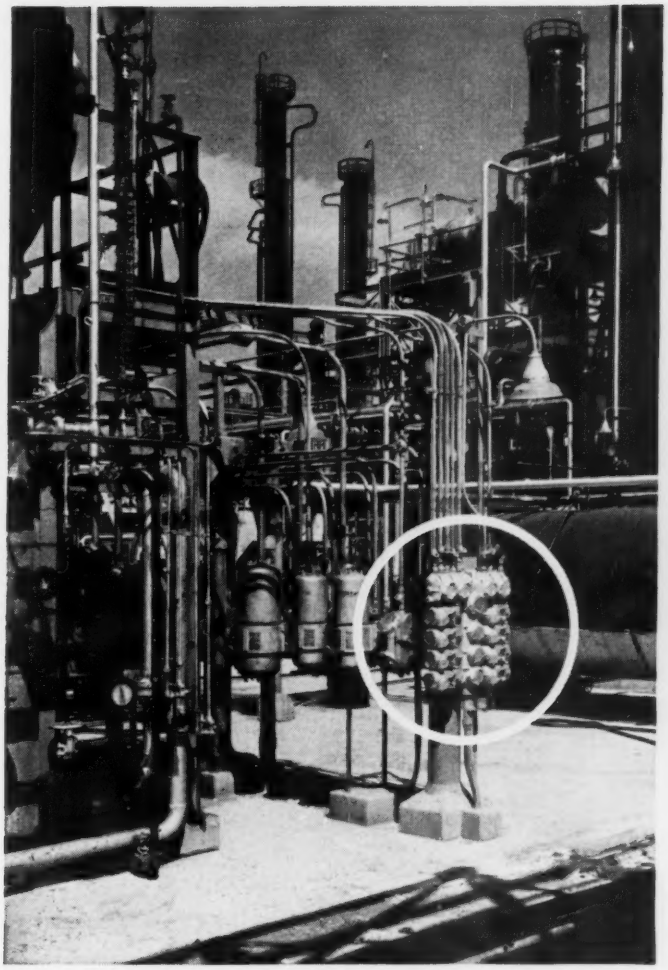
GRINDING WHEEL INSTITUTE MEMBER

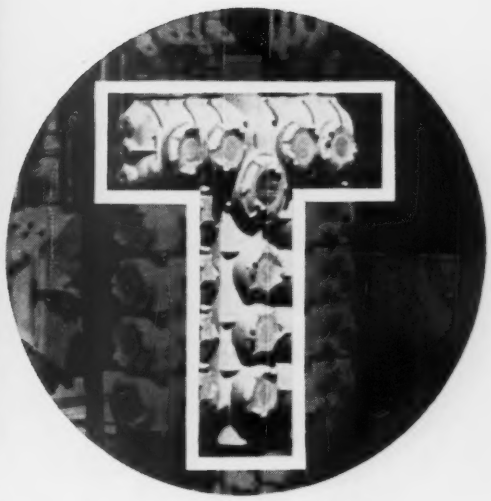
WRITE TO THE ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls





Crouse-Hinds type EDP explosion-proof panelboard installed and operating in an oil refinery. This 12-circuit condulet is built around a single T-shaped casting (outlined above) of dependable Hanna pig iron.

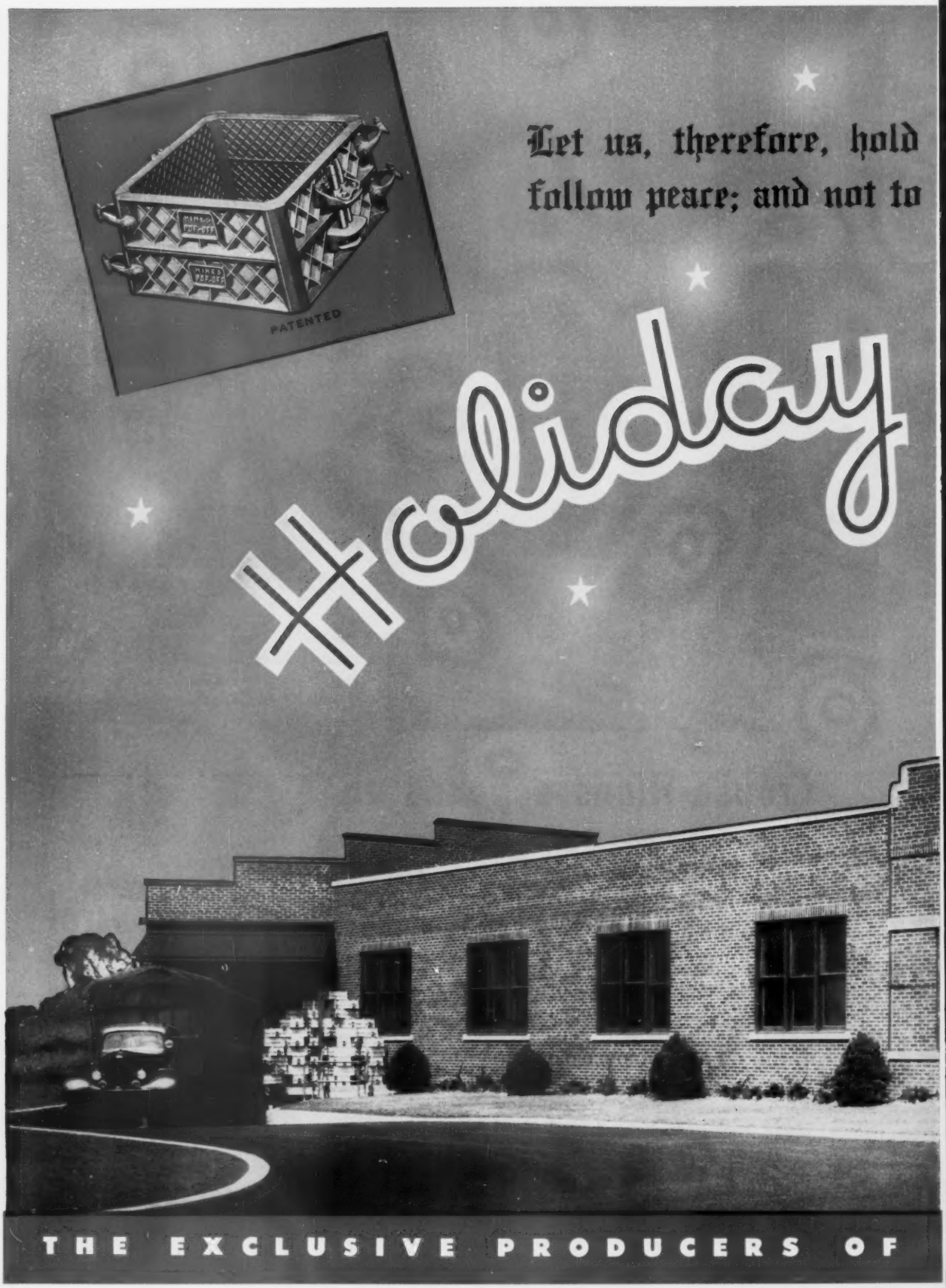
Crouse-Hinds depends on HANNA PIG IRON to keep explosions under control

The explosion-proof panelboard shown above is manufactured by Crouse-Hinds Co., of Syracuse, N.Y., a leading manufacturer of electrical equipment, specifically for use in hazardous locations where certain flammable gases and vapors are present. The cast enclosure *must* be flame-tight, non-porous and of high quality. That is why Hanna iron was chosen for this very important component.

Hanna makes all regular grades of pig iron, plus HannaTite and Hanna Silvery, and all are available in two sizes—the 38-pound pig and the smaller HannaTen ingot. Every Hanna iron has the qualities that produce denser, stronger castings with uniform machining qualities. To obtain prompt, expert servicing of your iron requirements, just call on Hanna or any of our trained representatives.

THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

Circle 584 on Page 51


Let us, therefore, hold
follow peace; and not to
Holiday
PATENTED
THE EXCLUSIVE PRODUCERS OF

fast to those who religiously
such as only pretend to desire.

—*Apocrypha: 1. Clement, vii, 13*

Greetings

POP-OFF FLASKS AND JACKETS

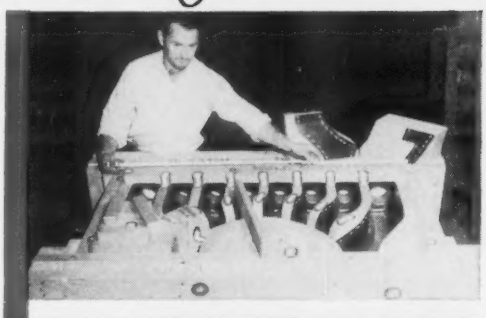
Circle 585 on Page 51

KOLD-SET®

The Original Kold Setting Binder

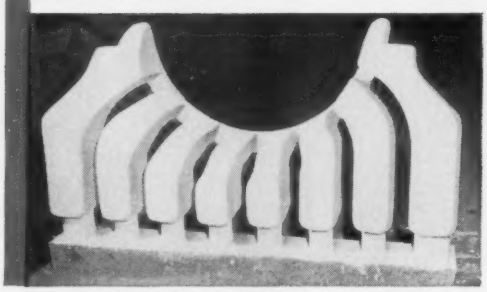
1.

Core box for making 500 lb. Zircon steam chamber core prior to pouring with Kold-Set sand.



2.

500 lb. Zircon steam chamber core must clean through 4" dia. ports. Double coat Kold-Set Zircon Wash applied green. Oven dried 8 hours at 425°F., rewashed, dried 4 hours.



FORMULA FOR QUALITY

at ATLANTIC STEEL CASTINGS COMPANY

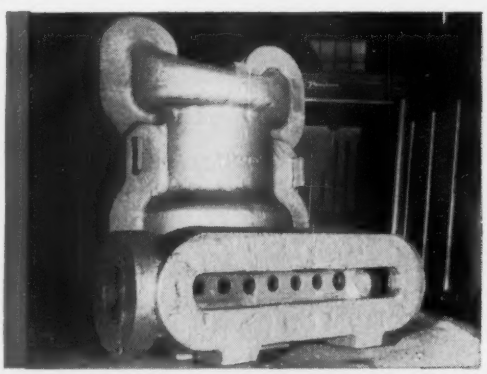
Chester, Pennsylvania

Atlantic is producing high-pressure steel castings of highest quality at substantially lower cost with Kold-Set cores.

3.

Turbine Base Casting (finished weight, 6500 lbs.) Direct cleaning time for steam chamber reduced from 5 days to less than 8 hours with Kold-Set core.

CLEANING TIME REDUCED 4 FULL DAYS



FIRST in Quality
—High grade raw materials and quality control during manufacture make KOLD-SET stand out first in performance—always uniform and made to the original formulation.

FIRST in Service
—A new method, such as the KOLD-SET process, must be introduced with service. Our engineers are experienced and can instruct in the proper method of application so you will derive the best performance at the greatest savings.

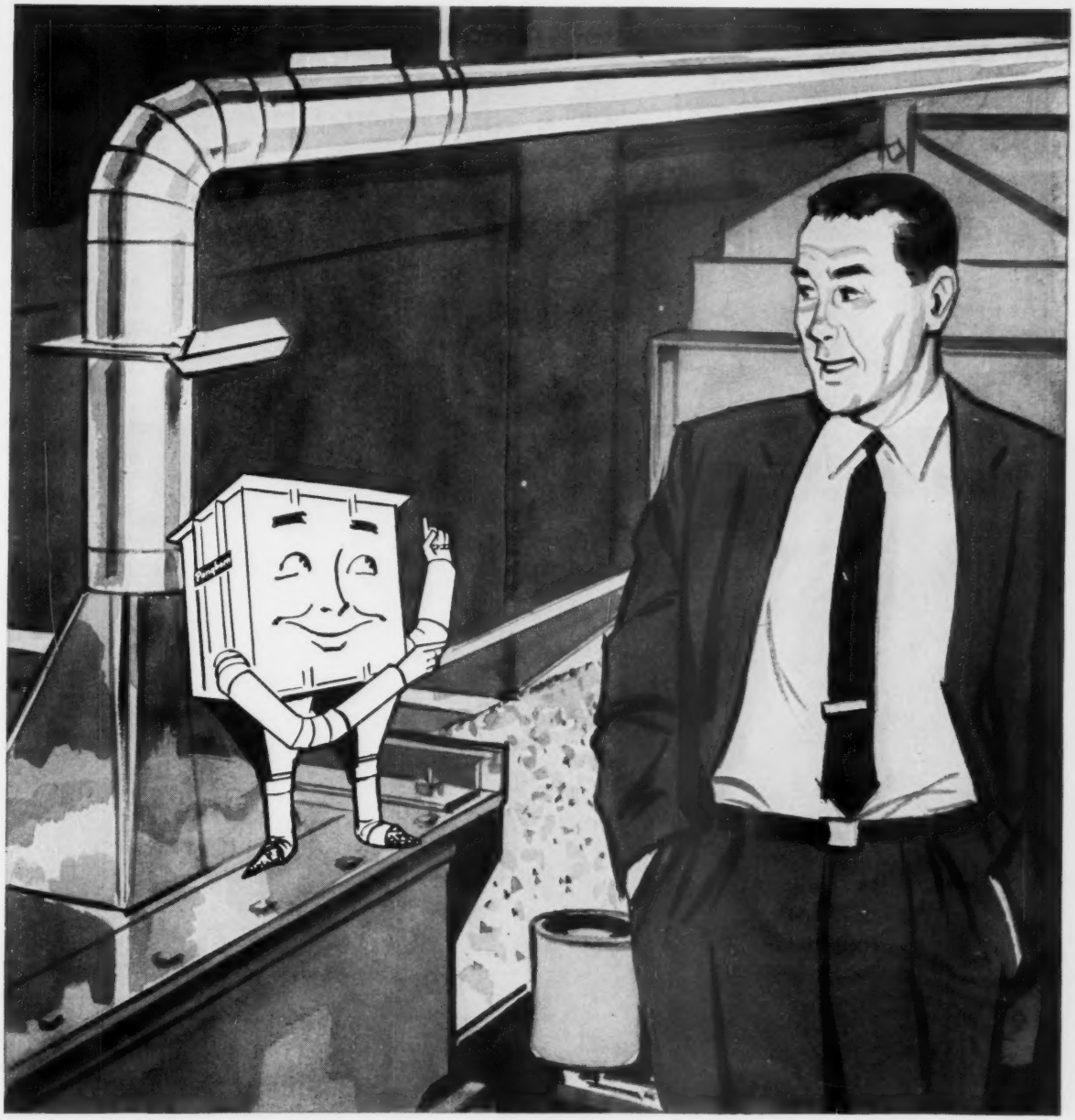
FIRST in Performance
—A quality product plus dependable engineering service have proven most important to consistent results. You can depend on controlled core production and excellent cast finish when KOLD-SET is used.

KOLD-SET®

G. E. SMITH, INC.

246 Washington Road Pittsburgh 16, Pa.

ORIGINAL AND EXCLUSIVE MANUFACTURERS OF THE KOLD-SET PROCESS IN THE UNITED STATES



"What? A 15% increase in production machinery life?"

Yes, Pangborn Dust Control can increase your machinery life up to 15% or more! Pangborn Dust Collectors trap dust controlled at the source to prevent the abrasive wear and tear of uncontrolled dust settling in valuable equipment. Pangborn Dust Control can save you thousands of dollars by substantially lengthening the life expectancy of your machinery.

What's more, Pangborn gives you other benefits of lower housekeeping costs, higher employee efficiency, extra profits from any salvage value and better employee and community relations. And Pangborn offers a complete line of collectors, dry and *wet*, for all jobs.

Why not discover how you can profit from Pangborn Dust Control? Write for Bulletin 922 to: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control & Blast Cleaning Equipment.*

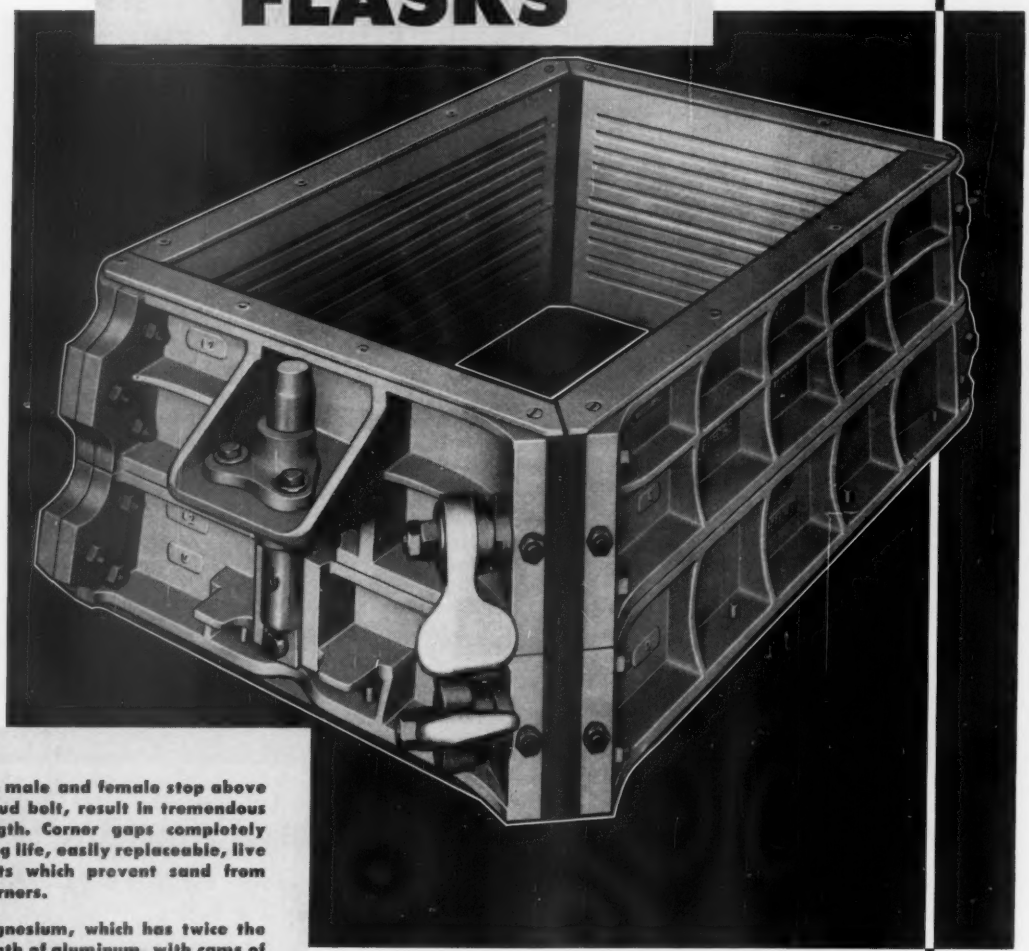
Pangborn CONTROLS DUST

Circle 587 on Page 51

No Other Flask Gives You All These Advantages

sturdy

Fremont SPREADLOCK FLASKS



■ Two-piece male and female stop above and below stud bolt, result in tremendous corner strength. Corner gaps completely closed by long life, easily replaceable, live rubber inserts which prevent sand from lodging in corners.

Made of magnesium, which has twice the tensile strength of aluminum, with cams of hardened steel forgings, the Spreadlock assures long service.

Magnesium weighs ⅓ less than aluminum, so they are light in weight, easier to handle.

Accurately machined inside surfaces and flanges, and steel-faced top and bottom flanges assure exacting work.

Write today for free literature and prices.

The Fremont FLASK Co.

FREMONT, OHIO

One of the most efficient manufacturing operations in industry today is the production of automobile frames. For better, faster descaling, three of the four producers in this field have selected Pangborn Rotoblast Descaling Equipment.

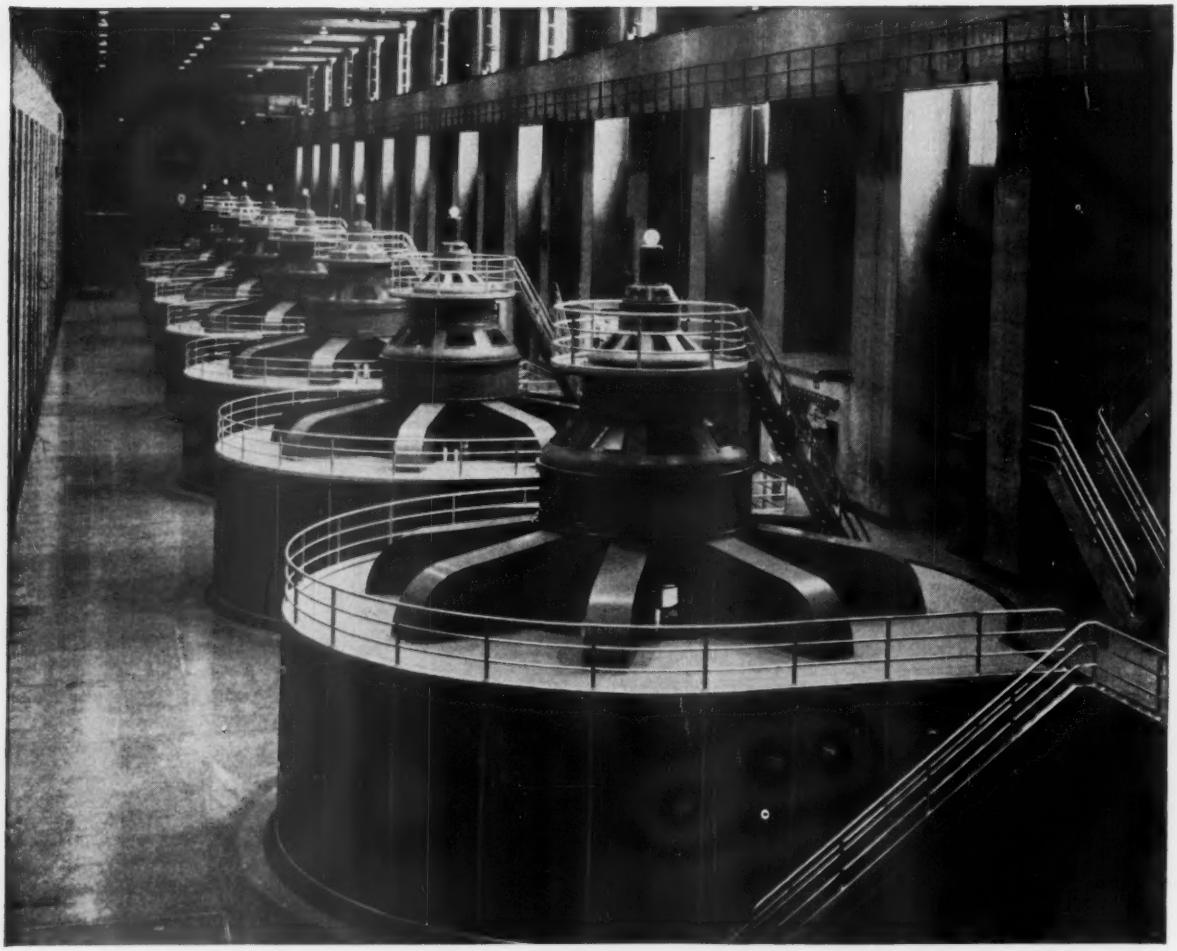
ROTOBLAST replaces pickling at Midland Steel.

Clean it fast with **Pangborn** *ROTOBLAST*®

PANGBORN CORPORATION, Hagerstown 1400, Maryland

Manufacturers of Blast Cleaning and Dust Control Equipment

Circle 589 on Page 51



POWER FOR GROWTH—Utility companies across the nation are building new plants to meet the demands of an expanding economy. They rely on foundries for the huge castings for turbines and other generating equipment they require.

TRULINE® BINDER HELPS KEEP FOUNDRIES HUMMING

When foundries are facing a full work schedule, Truline Binder can help keep castings moving smoothly from the oven to the cleaning room.

Truline's fast bake often means that one oven can do the work of two. Cores molded with Truline are strong, collapse readily, and are easily removed by knockout or hydroblast. Semi-finished castings need a minimum of repairs and welding when Truline is used.

In the core room, in the molds, in the cleaning room—every step of the way—Truline Binder can mean improved efficiency and reduced manhours per ton.

For information on Truline Binder, write:

HERCULES

Pine Chemicals Division, Naval Stores Department
HERCULES POWDER COMPANY
INCORPORATED
900 Market Street, Wilmington 99, Del.

NF57-2

to all our friends
in the industry

Thiem PRODUCTS INCORPORATED
Milwaukee 19, Wisconsin

and distributors

Circle 600 on Page 51

Faster . . . Easier . . . Lower Cost

Cupola Lining Repairs with GUNPATCH

for gun application

GUNPATCH is a special siliceous mix prepared for air gun repairs to the melting zone of the cupola. Extremely high grade quartz pebbles and sized quartz sands constitute the major part of this mix. Selected plastic fire clays and other bonding agents are used to induce the cementing action that firmly holds the quartz pebbles in place until the high temperatures of the operating cupola develop the necessary ceramic bond that welds the applied mass into a strong, dense lining. Foundry operators report less rebound loss in application and less burn-out even in extremely high tonnage melting operations. GUNPATCH can be used with all types of standard gun equipment. It is shipped bulk or in 100 pound multiwall bags.

DAUBPAX for foundries not equipped with pneumatic guns

DAUBPAX . . . one refractory for every foundry refractory requirement . . . a complete foundry maintenance material. DAUBPAX is a superior bonded quartz ramming mix. It is a silica-base plastic material shipped in 100 pound cartons ready for immediate use. In addition to being excellent for patching cupola walls, DAUBPAX may be rammed into the bottoms and side walls of receiving and pouring ladles to form patches or complete linings. DAUBPAX is also available in dry form for mixing on the job. Shipped in 100 pound bags.

For further information and prices, just write our Sales Office at the

PYRO REFRACTORIES CO., P. O. Box 488, Oak Hill, Ohio

PYRO

REFRACTORIES COMPANY

Oak Hill, Ohio

- **Durex Refractories Co. Jackson, Ohio**
- **Portsmouth Clay Refractories Co. South Webster, Ohio**

Circle 601 on Page 51

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FURTHER INFORMATION on Advertised Products ?

December 1957

SIMPLY CIRCLE AD ITEM NUMBER BELOW

521	536	551	566	581	596	611	626
522	537	552	567	582	597	612	627
523	538	553	568	583	598	613	628
524	539	554	569	584	599	614	629
525	540	555	570	585	600	615	630
526	541	556	571	586	601	616	631
527	542	557	572	587	602	617	632
528	543	558	573	588	603	618	633
529	544	559	574	589	604	619	634
530	545	560	575	590	605	620	635
531	546	561	576	591	606	621	636
532	547	562	577	592	607	622	637
533	548	563	578	593	608	623	638
534	549	564	579	594	609	624	639
535	550	565	580	595	610	625	640
641	656	671	686	701	716	731	746
642	657	672	687	702	717	732	747
643	658	673	688	703	718	733	748
644	659	674	689	704	719	734	749
645	660	675	690	705	720	735	750
646	661	676	691	706	721	736	751
647	662	677	692	707	722	737	752
648	663	678	693	708	723	738	753
649	664	679	694	709	724	739	754
650	665	680	695	710	725	740	755
651	666	681	696	711	726	741	756
652	667	682	697	712	727	742	757
653	668	683	698	713	728	743	758
654	669	684	699	714	729	744	759
655	670	685	700	715	730	745	760
761	776	791	806	821	836	851	866
762	777	792	807	822	837	852	867
763	778	793	808	823	838	853	868
764	779	794	809	824	839	854	869
765	780	795	810	825	840	855	870
766	781	796	811	826	841	856	871
767	782	797	812	827	842	857	872
768	783	798	813	828	843	858	873
769	784	799	814	829	844	859	874
770	785	800	815	830	845	860	875
771	786	801	816	831	846	861	876
772	787	802	817	832	847	862	877
773	788	803	818	833	848	863	878
774	789	804	819	834	849	864	879
775	790	805	820	835	850	865	880

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STREET .....

CITY ..... ZONE.....

STATE .....

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645	660	675	690	705	720	735	750
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647	662	677	692	707	722	737	752
648	663	678	693	708	723	738	753
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768	783	798	813	828	843	858	873
769	784	799	814	829	844	859	874
770	785	800	815	830	845	860	875
771	786	801	816	831	846	861	876
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FIRST CLASS
Permit No. 36
CLEVELAND, OHIO

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

—4c POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio

Reader's Service Dept.

FIRST CLASS
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Cleveland 13, Ohio

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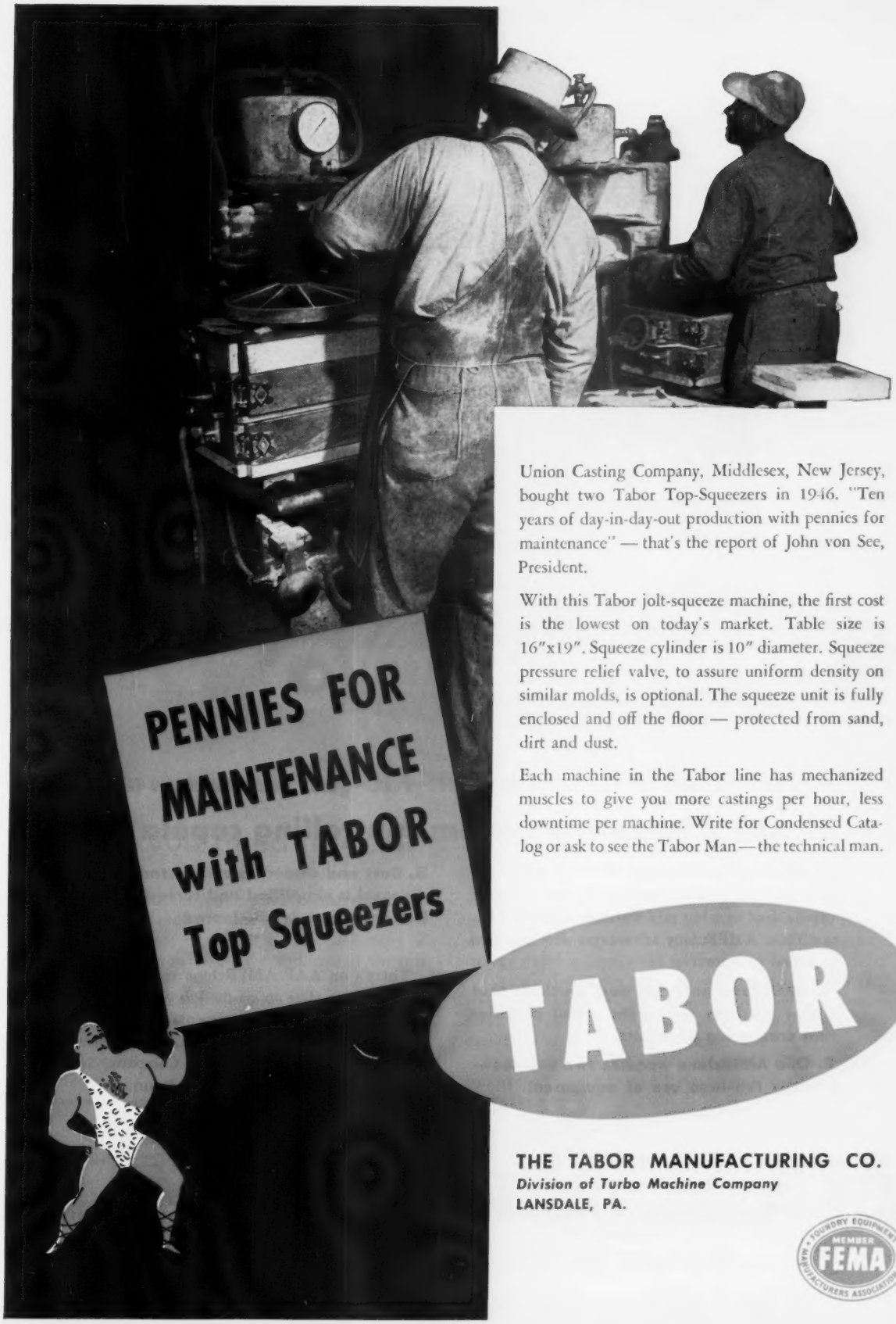


Union Casting Company, Middlesex, New Jersey, bought two Tabor Top-Squeezers in 1946. "Ten years of day-in-day-out production with pennies for maintenance" — that's the report of John von See, President.

With this Tabor jolt-squeeze machine, the first cost is the lowest on today's market. Table size is 16"x19". Squeeze cylinder is 10" diameter. Squeeze pressure relief valve, to assure uniform density on similar molds, is optional. The squeeze unit is fully enclosed and off the floor — protected from sand, dirt and dust.

Each machine in the Tabor line has mechanized muscles to give you more castings per hour, less downtime per machine. Write for Condensed Catalog or ask to see the Tabor Man — the technical man.

TABOR

THE TABOR MANUFACTURING CO.
Division of Turbo Machine Company
LANSDALE, PA.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Circle 602 on Page 51

THIS DUST PRODUCER

meets its master in THIS DUST COLLECTOR

Arrange now to see an on-the-job demonstration of AAF AMERclone system controlling cupola dust

Ninety-seven foundrymen observed this AAF AMERclone system controlling troublesome cupola dust at a big mid-western foundry. They saw these AMERclone advantages demonstrated in actual practice:

1. AMERclone *gets* the dust particles that cinder catchers *miss*—the *small* particles that create *big* problems.

2. One AMERclone handles two cupolas—permits full-time use of equipment.

3. Dust and cinders are collected dry . . . disposal is simplified and corrosion of collection system is eliminated.

•

There's an AAF AMERclone cupola installation near you. For an on-the-job demonstration, call your local AAF representative, or write direct to John Kane, Manager, Dust Control Division, American Air Filter Company, Inc., 266 Central Avenue, Louisville, Kentucky.

Herman Nelson Portable Heaters

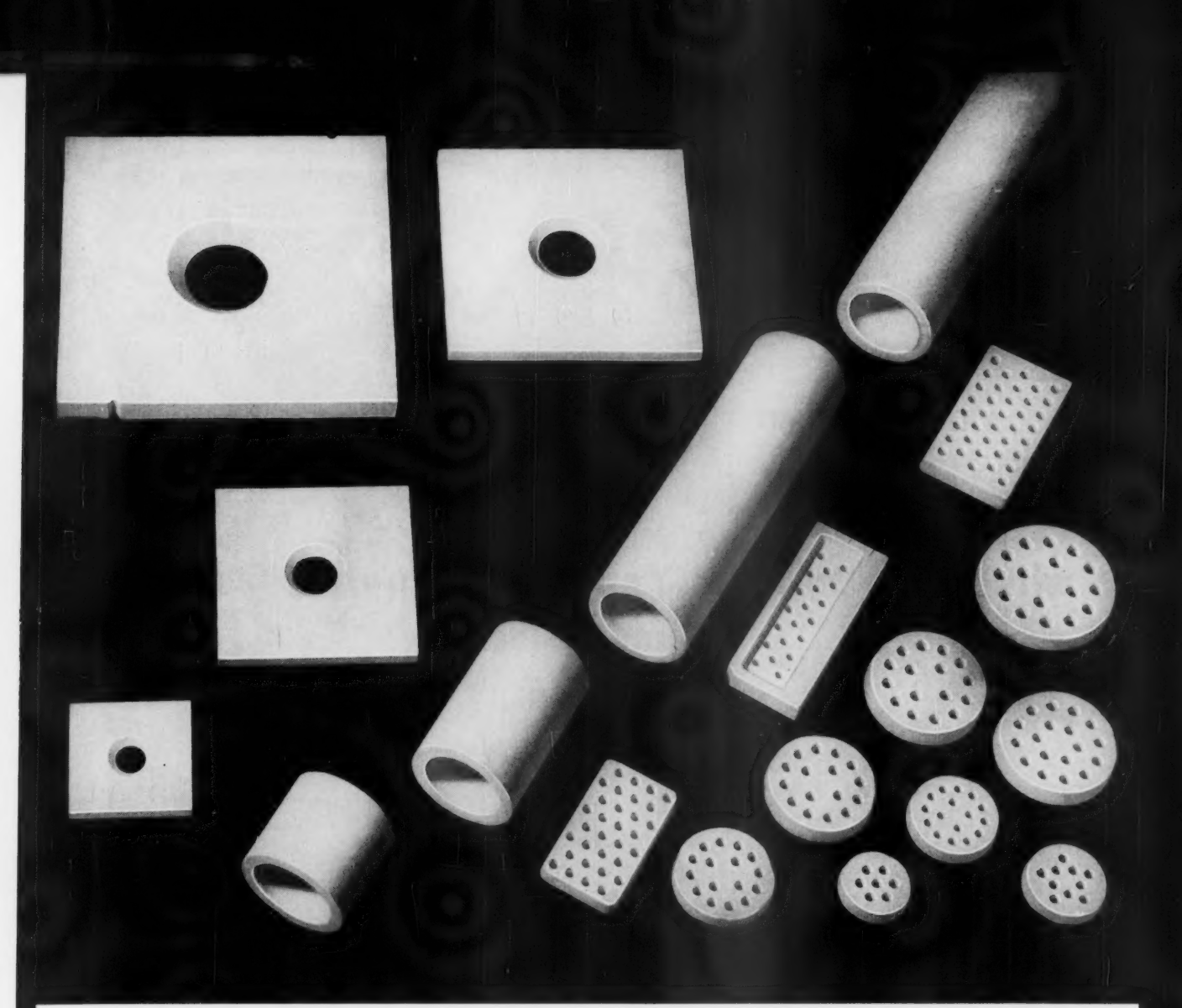
Illinois Heating Specialties

American Air Filter
COMPANY, INC.
266 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal 9, P. Q.

BETTER AIR IS OUR BUSINESS

AAF Electric Furnace Hoods

AAF Type K Exhauster



what do you need in **gating** and **risering** refractories?

To our customers in the foundry field this ad will come as *welcome news.* Louthan's line of production-proved refractories has been expanded to cover still more of your needs—help you save time and money on still more of your jobs.

Louthan Strainer Cores are now available in more sizes and shapes—and for *steel, iron, brass* and *bronze* castings. All provide an accurate choke for positive control of metal flow, eliminate slag and oxide inclusions.

Louthan Breaker Cores facilitate rapid removal of the riser with subsequent labor savings. There is no core gas. You get cleaner castings. Available for all riser diameters from 2″ to 12″, and for use with *any metal casting* risering from a flat surface.

Louthan Gate Tiles prevent erosion of the gates in steel castings. They safely withstand high temperatures, will not react with the molten metal. All popular diameters and lengths can be furnished.

So again we say, "What do *you* need?" *We have it!* If you haven't used Louthan Refractories, it will pay you to try them.

THE Louthan MANUFACTURING COMPANY

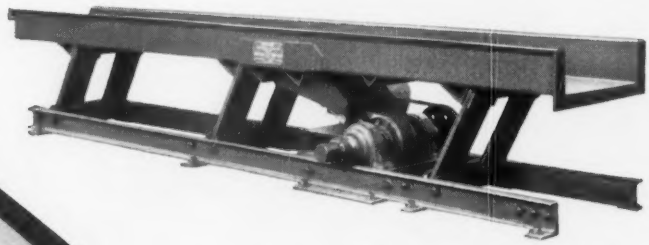
(A SUBSIDIARY OF FERRO CORPORATION) EAST LIVERPOOL, OHIO

REPRESENTATIVES: M. A. BELL COMPANY, St. Louis 2, Mo. . . . Houston 3, Texas; **FOUNDRY SUPPLY COMPANY,** Minneapolis 16, Minn.; **MILWAUKEE CHAPLET & SUPPLY CORP.,** Milwaukee 46, Wisc. . . . **FREDERIC B. STEVENS INC.,** Detroit 16, Mich. . . . Indianapolis 7, Ind. . . . Buffalo, N. Y.; **MISSOURI REFRACTORIES COMPANY,** 4599 Pacific Blvd., Los Angeles 58, California

Circle 604 on Page 51

A TRICKLE OR AN AVALANCHE

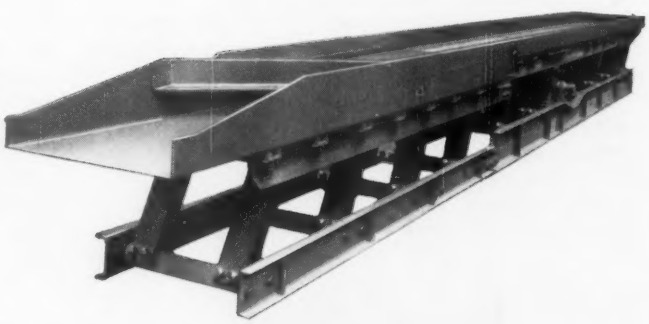
with an Electrical or Mechanical Vibrating Conveyor in any capacity



MMV MEDIUM-DUTY CONVEYOR

LMV LIGHTWEIGHT CONVEYOR

HMV HEAVY-DUTY CONVEYOR



BACK IN 1928 the Traylor Vibrator Company (acquired by Jeffrey in 1933) built the first electric vibrating conveyor, and you know what a tremendous success this line has been . . . feeders, dryers and coolers. Today they're on every class of material—feathers to lead, handling ounces and tons with equal economy and sureness.

In 1948 the men responsible for those electrical conveyors (still with Jeffrey, by the way) turned their attention to *mechanical* vibrating conveying.

First the HMV heavy-duty mechanical vibrating unit was developed—proved highly efficient and dependable, and now accepted as "standard" by all industry. Then came the MMV mechanical vibrating conveyor for medium capacities, but with the many advantages of its predecessor. Finally the lightweight, compact, low-cost LMV completed the Jeffrey line.

Catalog 860-B describes the Jeffrey long line of vibrating conveyors and their application. The Jeffrey Manufacturing Company, 907 North Fourth Street, Columbus 16, Ohio.

CONVEYING • PROCESSING • MINING EQUIPMENT . . . TRANSMISSION MACHINERY . . . CONTRACT MANUFACTURING

JEFFREY

Circle 605 on Page 51

Why Grandmother!

Stories on cleaning room problems—just like the kind you tell the youngsters—can have a happy ending. And we're writing new ones day after day for foundries where high snagging costs and low production have been wolfing up profits.

If *you* are ready to "cry wolf," let us send CINCINNATI (PD)° SNAGGING WHEELS to the rescue. Customers report that the fast, easy cutting action of CINCINNATI (PD) SNAGGING WHEELS really cuts snagging time . . . and thus saves money.

Our customers report, too, that POSITIVE DUPLICATION (PD) means *another* savings. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

CINCINNATI (PD) WHEELS are made in vitrified and resinoid bonds for both ferrous and non-ferrous foundries and are available in a complete variety of sizes and shapes. *And these better, cost-cutting* (PD) WHEELS *are priced no higher than ordinary wheels.*

So, if grinding problems have you ready to shout for help, contact your CINCINNATI Grinding Wheels distributor. Or, contact us direct. Write, wire, or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

(PD) POSITIVE DUPLICATION

CINCINNATI° *Grinding Wheels*

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

°Trade Mark Reg. U.S. Pat. Off.

Circle 606 on Page 51

AUTOMATIC AIR-TO-AIR CONTROL assures

#21 Type "C" Airomatic Automatic Drag Molding Unit

Heavy Duty Jolt & Power Squeezer Drag Molding Machine with Pneumatic Pattern Draw. Equipped with air operated car type squeeze head and built-in flask roll-in and mold roll-out device with measuring sand hopper, flask indexing device and sand spill upset, flask feed-in elevator, mold turn-over and mold transfer.

uniform jobs

dependable jobs

better jobs

at less cost

in the

NEW

NICHOLLS AIROMATIC

AUTOMATIC MOLDING MACHINES

There is nothing to get out of order — no limit switches, no electrical timers, no electric pressure switches, no electrical latch relays.

With simple, reliable "push-button" operation the new Nicholls Airomatic utilizes the driving force of the machine itself to make, close, remove and return **high-quality** sand molds **in quantity . . . automatically . . . consistently . . . continuously.** No guesswork, no wasted materials, no lost manhours, no bottlenecks.

Look at **your** equipment **today.** Whatever your molding requirements, there's a Nicholls machine to fit the job. For information, call or write

WM. H. NICHOLLS CO., INC.
Richmond Hill 18, Long Island, N. Y.

NICHOLLS

• FOR HALF A CENTURY THE BEST IN MOLDING EQUIPMENT

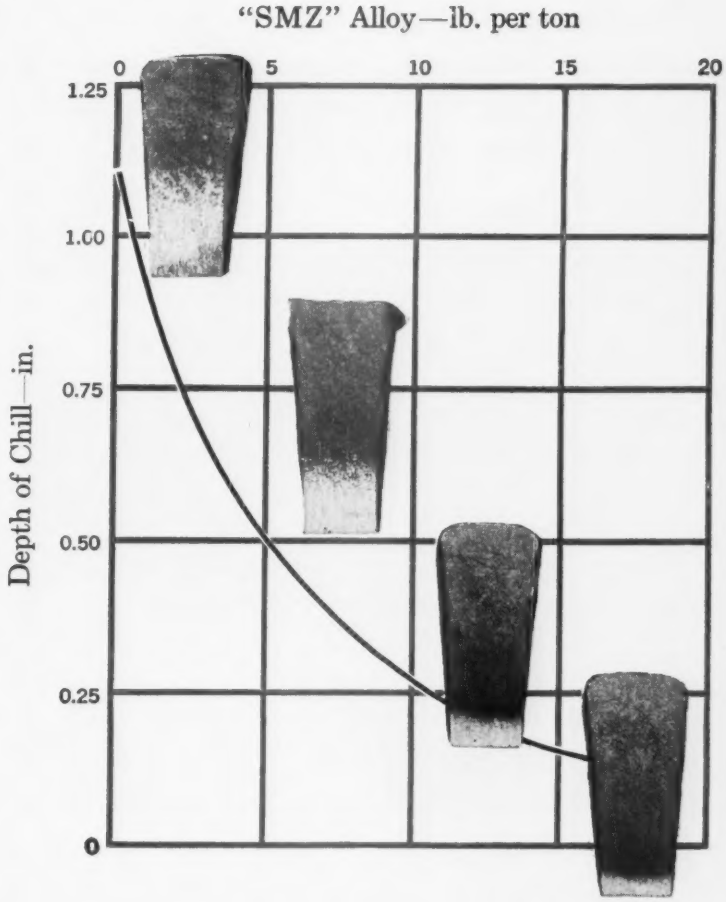
IMPROVE MACHINABILITY OF GRAY IRON

...eliminate hard spots with SMZ alloy

The chill blocks at the right clearly show how the chilling properties of gray iron are sharply reduced by small ladle additions of SMZ alloy, a strong graphitizing inoculant containing silicon, manganese, and zirconium. The blocks were poured from a 3.15 per cent carbon, 1.80 per cent silicon iron. Additions of 5, 8, and 16 pounds of SMZ alloy per ton (0.15, 0.25, and 0.50 per cent silicon) progressively reduced the chill depth from 1.09 in. for the untreated iron to 0.19 in. for the iron which received the heaviest addition.

The exceptional ability of SMZ alloy to eliminate chill in corners and thin sections vastly improves the machinability of iron. Foundries have reported that inoculating iron with SMZ alloy increases the machining rate by as much as 25 per cent. As little as 2 to 4 pounds of the inoculant are sufficient to eliminate hard corners and edges in light castings. For harder irons of low carbon and silicon contents a larger addition of the alloy may be required.

Write or phone your nearest ELECTROMET office for more information on this important ladle-addition alloy. Ask for the booklet, SMZ Alloy—An Inoculant for Cast Iron. An ELECTROMET representative will also be glad to give you all the technical details. ELECTROMET METALLURGICAL COMPANY, Division of Union Carbide Corporation, 30 E. 42nd Street, New York 17, N. Y. *Offices:* Birmingham, Chicago, Cleveland, Detroit, Houston, Los Angeles, Phillipsburg, N.J., and San Francisco. *In Canada:* Electro Metallurgical Company, Division of Union Carbide Canada Limited, Toronto.



METALS DO MORE ALL THE TIME ... THANKS TO ALLOYS

Electromet
FERRO-ALLOYS AND METALS

UNION CARBIDE

The terms "Electromet" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

Circle 608 on Page 51

Protection from Metal Splashes

Here it is . . .

AO's New 315 NFA Foundry Goggle

(Also available in Dust goggle as No. 316 with 150 mesh inner screen set behind a 16 mesh screen)

Engineered Vision and Protection at their best for Foundrymen and Others!

This goggle (like its predecessor which American Optical developed for the NFA) is recommended for protection against impact hazards such as chipping, melting, pouring, grinding, babbitting, riveting, hand tool and machine work. Goggle is regularly supplied with soft *plastic* mask — with leather available. Edges of sponge rubber are bound with corduroy. Super Armorplate or 6 Curve Super Armorplate clear or Calobar lenses in medium, dark or extra dark shades.

FEATURES . . .

1. Greater Protection — larger face mask
2. Better Vision — 57.8 mm. wide vision lenses instead of the former 50 mm. round lenses
3. Increased (double) Ventilation — 40 mesh screen
4. Perfect Fit — Over all types of spectacle glasses. One-piece, easily adjustable rubber headband "clips" through metal frame instead of mask — assures maintained closer fitting
5. Standard screw endpieces

Quality costs no more! Always insist on the AO Trademark. Your nearest American Optical Safety Products Representative can supply you.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
Branches in Principal Cities

Circle 609 on Page 51

Circle 610 on Page 51→

AN ANNOUNCEMENT OF SIGNIFICANCE

to FOUNDRYMEN . . . . .

THE NATIONAL ENGINEERING COMPANY

Announces

the formation of

NATIONAL Air CONVEYOR
CORPORATION

. . . a wholly owned subsidiary engaged in the design, engineering and manufacture of penumatic conveying equipment for the transport of materials in the foundry.

WHAT IT WILL MEAN TO YOU

As the first foundry engineering firm to be actively engaged in pneumatic transport, National Engineering Company will now be able to offer you:

- The latest patented and *foundry-proven* equipment.
- The advantage of over 40 years of foundry materials handling and engineering experience.
- Competent, experienced assistance in the integration of pneumatic equipment with existing or proposed materials handling equipment.
- *Complete* design, engineering, manufacturing and erection services for the preparation and handling of sand by mechanical or pneumatic means.
- Most important, FOLLOW THROUGH . . . National Air Conveyor Corporation will provide competent repair service and parts facilities.

Our decision to enter the field of pneumatic transport is a natural outgrowth of National's already extensive experience with such equipment. Our optimism for its growth is secure in the competence and enthusiasm of the experienced foundrymen that now staff National Air Conveyor Corporation.

NATIONAL ENGINEERING COMPANY

549 W. WASHINGTON BLVD.
CHICAGO 6, ILLINOIS

ANOTHER . . . Product of a Practical Foundryman

F-578

In metal cutting,
Calumet Steel Castings Corp.
rated **HOEGANAES**
ANCOR-FLAME IRON POWDER
superior in 7 *ways*

Calumet Steel Casting Corp., Hammond, Indiana were interested in developing an economical means of metal removal on the various types and sizes of stainless steel castings they produced.

Their testing program was conducted under ideal conditions . . . actual production conditions . . . and involved several iron powders recommended for their type of operation. Hoeganaes Ancor-Flame Iron Powder won out. Mr. C. Masepohl, Works Manager, stated it this way, "We came to the conclusion that Hoeganaes Ancor-Flame was superior to those tested—superior in 7 ways." And these were the advantages which the tests revealed.

1. Hotter flame.
2. Faster Cutting (metal removal).
3. Rapid recovery.
4. Lowest rate of consumption.
5. Uniform flow.
6. Longer tip life.
7. Lower unit cost.

"In our evaluation of the iron powders tested, it was, as all phases of production are, necessary to arrive at the monetary saving, as well as employee satisfaction, which would meet with management approval.

"We feel confident that the Hoeganaes Ancor-Flame Iron Powder has provided us with that evaluation."

Send for your free copy of the data-filled Hoeganaes Folder #105. Learn more about what you can expect from iron powder metal cutting.

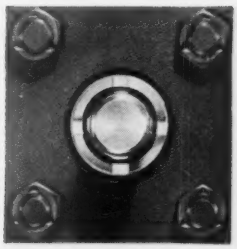
HSIC

HOEGANAES

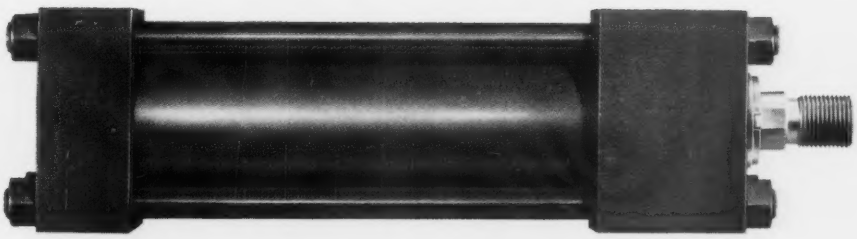
HOEGANAES SPONGE IRON CORPORATION

RIVERTON, NEW JERSEY

SALES REPRESENTATIVES IN PRINCIPAL CITIES: Birmingham, Chicago, Cincinnati, Cleveland (Fostoria), Edmonton (Alberta, Canada), Los Angeles, Minneapolis, New England (Elmira, N.Y.), Philadelphia (Riverton, N. J.), Pittsburgh, San Francisco, St. Louis



Made for the tough buyer



The discriminating engineer is intolerant—intolerant of anything but the very best in his plant and in his product.

For these tough buyers Hannifin cylinders are made. Into these cylinders go original, exclusive features of design, precision manufacture, and the ability to outperform others with the very minimum of maintenance.

You would expect to pay more for Hannifin cylinders. Actually there is no price premium. We can deliver them to you promptly in the sizes and mounting styles you require.

AIR AND HYDRAULIC

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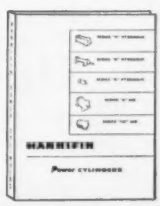

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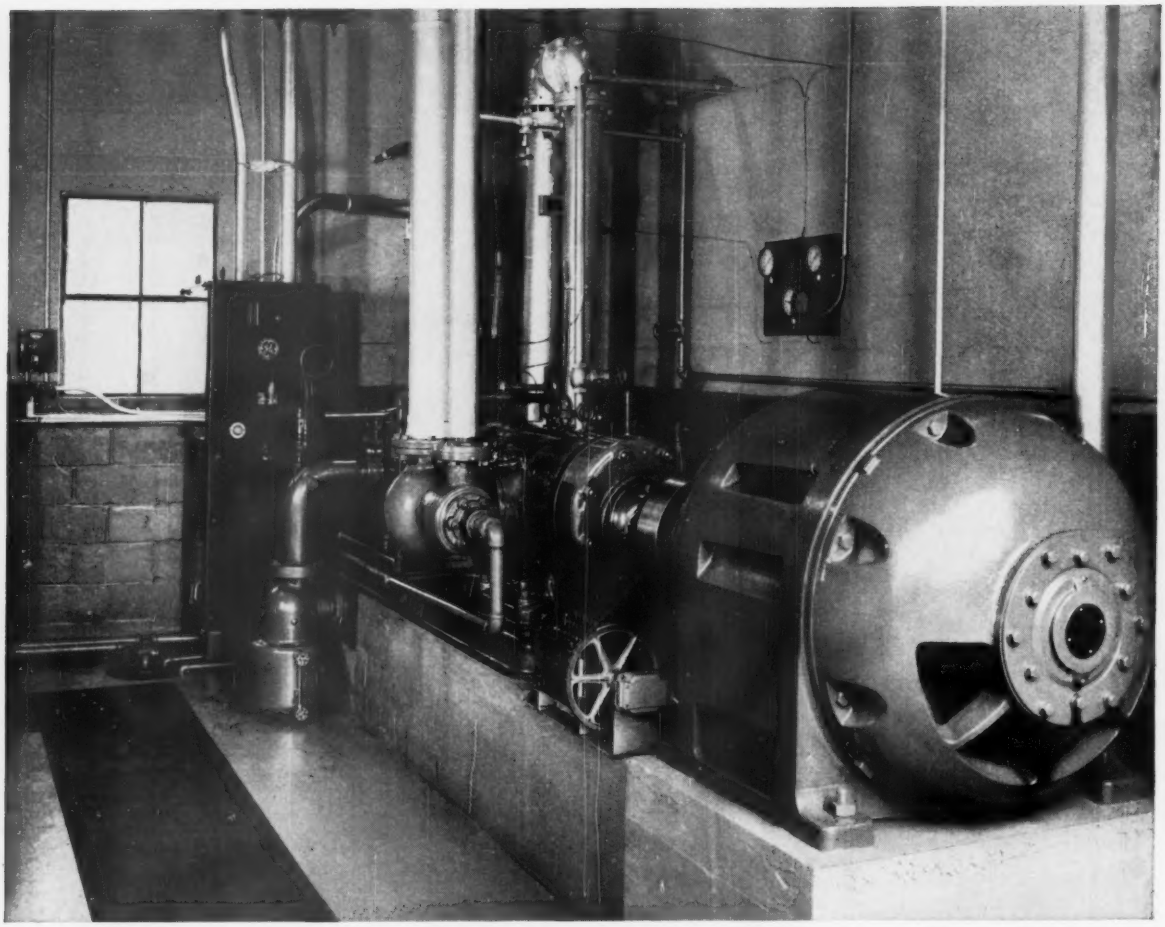

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C-298
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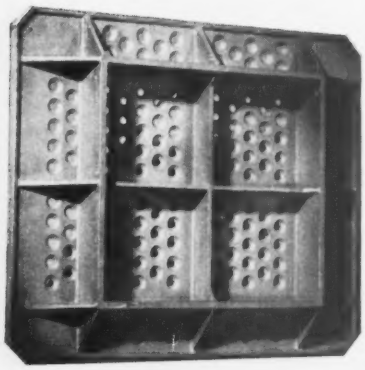

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Circle 615 on Page 51

Readers' Comment

Corrects CO_2 Facing Mix

TO THE EDITORS:

We would like to call to your attention that "Facing Mixes—Mix 2," FOUNDRY, Oct. 1957, p. 105, should be as follows: 300 lb Jersey silica sand, 85 AFS; 1½ per cent pitch compound (85 per cent pitch, 15 per cent dextrine); 4½ per cent commercial proprietary sodium silicate binder.

ANTON DORFMUELLER JR.
Eastern Sales Manager
Archer-Daniels-Midland Co.
Foundry Products Div.
2191 *West 110th St.*
Cleveland 2, Ohio

Defends the Tensile Test

TO THE EDITORS:

I would like to make a few comments on the article "The Case Against the Tension Test" by John B. Caine which appeared in your November issue.

First, I cannot think of a single instance where technological advances have been brought about by promotion of selfish interest. I think it is obviously both necessary and desirable that producers and consumers of castings should take a broader view of their mutual problems than this.

Trying to debunk the tensile test is a little like an ostrich sticking his head in the sand. If we pretend the problem does not exist, perhaps it will go away and quit bothering us. I think it is fair to state that the tensile test is here to stay, and everyone must learn what can be expected in this test on cast products and govern himself accordingly. Actually, the tonnage of castings being produced indicates clearly that most designers know and understand the advantages as well as the limitations of casting.

I would like to cite an actual example. This involved the testing over a period of several years of about 50 almost identical castings produced from different heats of the same grade of steel. Heat treatment consisted of normalizing and tempering. There was no difficulty with meeting the minimum requirements of a tensile test as prescribed by the applicable ASTM Standards.

Finally, however, the integrally cast test bars were removed from one casting and it was found that while the yield and tensile strengths were satisfactory, they were a little lower than average of earlier tests. This could be due to the use of a slightly higher tempering temperature, or a balance of composition which yielded somewhat lower hardenability. If this were the case, it would be expected that the elongation would be correspondingly high. Unfortunately, this was not the case. Earlier castings had shown no difficulty in meeting the minimum elongation requirement of 24 per cent while the two test bars removed from this particular one showed elongations of 4 and 10 per cent. The tensile test is simple, standardized, inexpensive, and easier to perform, and in this case clearly showed that there was something seriously wrong with the casting in question.

It is certainly well known that the tensile test gives no information on susceptibility to brittle fracture, but where it is anticipated that this may be a problem in service, usual practice is to require Charpy tests. While the notch in the Charpy test is fairly well standardized, we do not think that there can be any argument with the statement that the tendency of a metal to be notch brittle depends on the notch radius as well as the temperature.

If the foundryman is going to promote a specific type of notch testing, I hope he will have sense enough to select one which also determines whether the casting will perform the intended service. After all, the purpose of any test is not to get the casting accepted, but to demonstrate its adequacy for the intended application.

It seems to me that the author of this article has completely omitted one of the most important points that could ever be made in the defense of castings. Specifically, I am thinking of their lack of directional properties. Tensile properties in castings are reasonably uniform regardless of the direction from which they are cut, and this is certainly far from the case in wrought products.

Further, I cannot understand the omission of a reference to the excellent paper entitled "Fatigue Properties of Comparable Cast and Wrought Steels" by Evans, Ebert, and Briggs which appeared in the ASTM *Proceedings* for 1956.

J. A. CAMERON
Chief Metallurgist
Elliott Co.
Div. of Carrier Corp.
Jeannette, Pa.

Heavy material causing high maintenance?
Read how Pacific Northwest Alloys

Loading an alloy which averages 8,500 lbs/yd, cut repair costs 80%

THE BACKGROUND

Pacific Northwest Alloys, Inc., is a wholly-owned subsidiary of Chromium Mining & Smelting Corporation of Chicago. Their plant, located just outside Spokane, Washington, produces an alloy known as low carbon ferro chrome from African, Philippine and domestic chrome ores. This new fast-melting alloy is used in production of some of the new low-carbon stainless steels.

THE PROBLEM

Low carbon ferro chrome is *heavy.* An 8-inch chunk of it weighs nearly 100 lbs. Tractor shovels load this dense alloy by impact loading. Other tractor loaders pounded themselves to pieces moving the jagged, interlocking lumps. Maintenance costs grew so high, in fact, management insisted new machines be tried. Crawlers were considered, but proved too slow. Then, company officials heard about Michigan Tractor Shovels, obtained an in-plant demonstration.

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WHEREVER METALS ARE CAST . . . FOUNDRY

December 1957

In the Right Places

When Hermann P. Good, James S. Vanick, and Charles F. Walton presented the first copy of the *Gray Iron Handbook* to President Parrish at the opening session of the Gray Iron Founders' Society's annual meeting in October, they brought to a successful conclusion a project that has been long and arduous. Now the gray iron industry has joined the other ferrous foundry industries in providing engineering data on its products. Congratulations are due the society, its staff, and members of committees who contributed to the project.

Development of engineering handbooks for the foundry industry goes back to 1932 when a Joint Committee on Foundry Education in Engineering Schools, sponsored by the American Foundrymen's Society and having representatives from the Gray Iron Founders' Society, Malleable Founders' Society, Steel Founders' Society of America, National Foundry Association and the Foundry Equipment Manufacturers Association proposed a handbook. A Joint Committee on Cast Metals Handbook was formed, and the first edition of the *Cast Metals Handbook*, treating both ferrous and nonferrous castings, was published in 1935. The fourth edition was published this year.

The Steel Founders' Society of America published the *Steel Castings Handbook* in 1941, brought out a second edition in 1950, and has set 1960 as the target date for a new edition. The Malleable Founders' Society published *American Malleable Iron—A Handbook* in 1944 and now is in the process of preparing a new edition. Other foundry groups similarly have published design manuals or other types of aids for their members and their customers.

Publication of these handbooks has provided major tools for the merchandising programs of industry groups and individual foundries. Handbooks provide design engineers and casting buyers with usable and accurate information on physical and chemical properties, factors of design, problems of manufacture, effect of treatments, applications, and recommendations to users. Because information of this nature is available, users of castings have been able to design their products with greater confidence.

To be of maximum value in promoting the sale of castings, handbooks must be placed in the hands of design engineers and others who have the problems of specifying materials and processes. Experience has shown that although some copies are purchased by casting customers, satisfactory distribution and real benefits depend upon the producers of castings. Publication of the handbook is only the first step. The second requires that foundries purchase the handbooks in quantities and see they are distributed gratis to their customers, prospective customers, technical schools, and universities. This process has been under way for years in the steel and malleable groups.

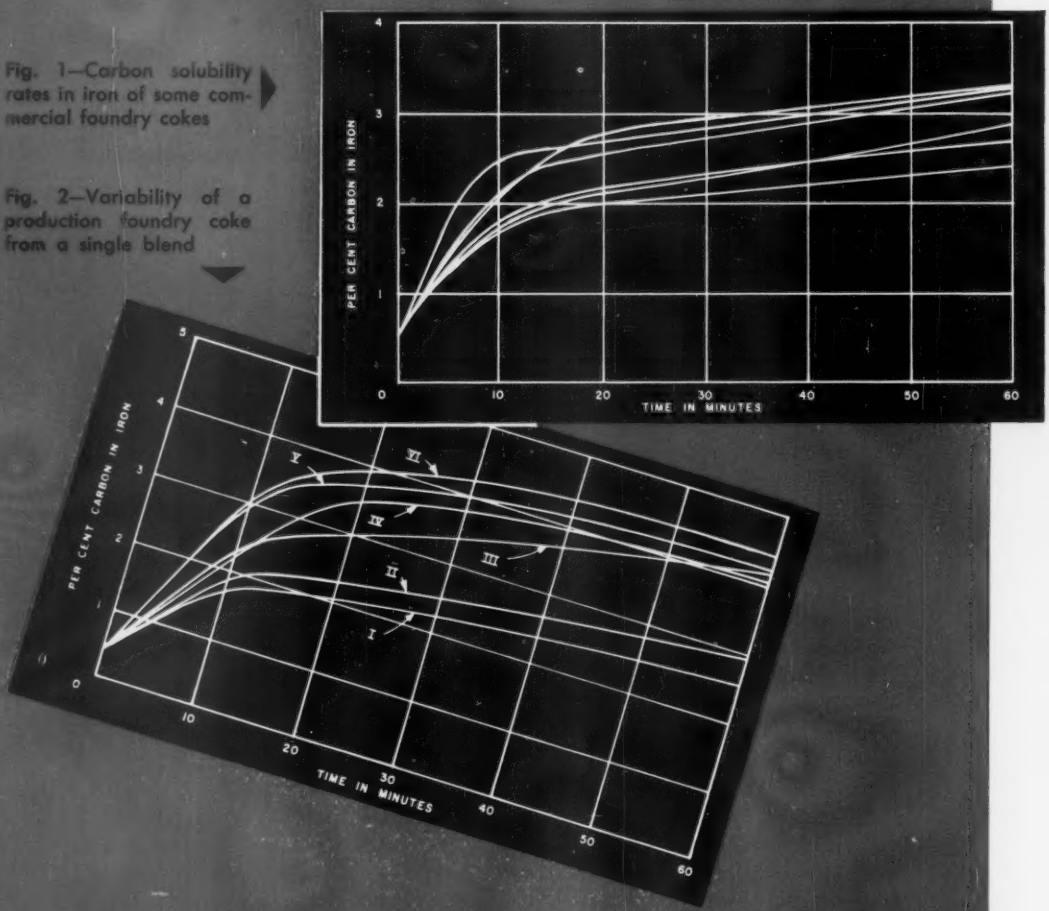
It is to be hoped that gray iron foundrymen will follow the lead of other ferrous castings producers and see that the *Gray Iron Handbook* quickly gets into the places where it will do the most good.

Frank G. Steinebach

Editor

Fig. 1—Carbon solubility rates in iron of some commercial foundry cokes

Fig. 2—Variability of a production foundry coke from a single blend



CARBON—PICKUP IN THE CUPOLA

How To Test for Factors Affecting It

Ash content of coke, or its major constituent, silicon, has a significant inhibiting effect on carbon solubility in iron. The type of iron also seems to be important to the amount of carbon-pickup

By MICHAEL PERCH and CHARLES C. RUSSELL
Koppers Co.
Pittsburgh

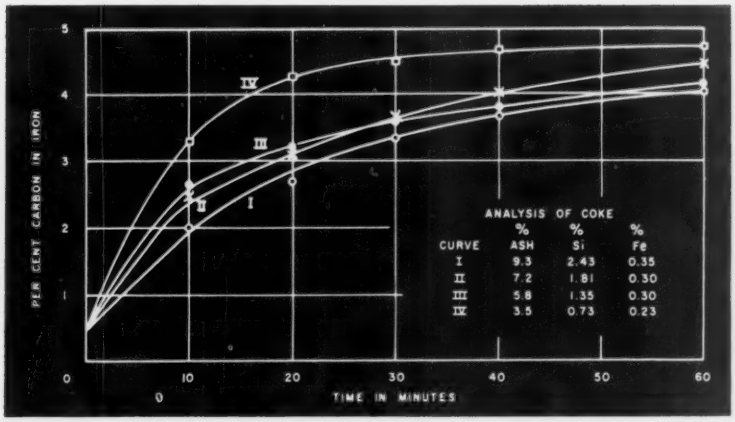


Fig. 3—Effect on solubility of coke in iron of ash reduction of coal mixture by float-and-sink methods

THE foundry cupola melting process depends to a large extent on the coke as a source of carbon. Some of the carbon enters the molten product from the pig iron and, to a lesser extent, from the scrap. When large quantities of steel scrap are used in the charge, the additional carbon required to raise the carbon content of the iron to the desired level must come from the coke. This, however, presents a problem, for cokes apparently vary in their ability to supply carbon.

It is generally agreed that carbon content of the cupola melt depends on (1) conditions in the cupola, (2) composition of the iron and, (3) characteristics of the coke, which can be broken down into the following factors:

1. *Conditions in the Cupola*
   a. Temperature of iron
   b. Blast temperature
   c. Moisture in blast
   d. Length of time of contact of iron and coke
   e. Amount of agitation and mixing
   f. Composition of gas above molten iron
2. *Composition of the Iron*
   a. Type of iron being melted
   b. Carbon content of the iron
   c. Kind and amount of other constituents in the iron
3. *Characteristics of the Coke*
   a. Carbon content of coke
   b. Ash content of coke
   c. Other constituents in coke
   d. Nature of carbon-amorphous, graphitic
   e. Size or active surface area of coke
   f. Surface characteristics of coke
   g. Reactivity of coke
   h. Strength of coke

Temperature Influence—Ruer and Birens[9] and Chipman[3] have shown that the amount of carbon picked up by the iron is highly dependent on the temperature of the melt; the higher the temperature, the higher is the amount of carbon dissolved in the iron. At 1500° C, the former observed a value of 5.15 per cent carbon in pure iron at equilibrium, while Chipman by calculation found 5.10 per cent. Temperature attained by the iron in the cupola is apparently affected by the condition of the bed, the characteristics of the coke, moisture in the blast[5], blast temperature, etc. According to Mayers[6], the physical rather than the chemical properties of the coke are accountable to a large degree for high-temperature development and resultant high carbon-pickup. Low reactivity in the coke is necessary for this development of high temperature. Large pieces of coke, especially in the lower part of the bed, must be obtained by the use of strong coke that can withstand breakage in its descent in the cupola.

Coke that has the ability to supply the high carbon-pickup apparently has properties that are closely related to cokes of low reactivity. According to evidence presented by R. V. Riley[7], electrode graphite dissolved in molten iron at a faster rate than any other type of carbon, and petroleum coke gave a relatively high rate of carbon solution. Anthracite, while lower than petroleum coke, was superior to the cokes tested.

Riley[7] also showed that carbon-pickup from coke is related to its ash content. Also, the accumulation of ash on the surface of coke prevents good contact of carbon with molten iron and results in lower carbon solubility. When a flux of sodium carbonate or borax was added to the coke, however, the carbon-pickup was increased materially. In one test, sodium-carbonate-treated coke gave a total carbon in the iron of 3.9 per cent, compared to about 0.9 per cent for untreated coke. This is an extremely important finding and points to the conclusion that foundry coke should be of the lowest ash possible and also that the ash should have a low fusion temperature, or that a flux should be added to the coal before coking or to the coke.

Riley in his work developed an excellent small-scale test for determining the carbon solubilities of various coke and carbonaceous materials, as well as for evaluating the various factors that affect carbon solubility in iron. Briefly, his method consisted of melting approximately 10 lb of iron

This paper was presented at the 1957 meeting of the American Chemical Society, where it received the Bituminous Coal Research Inc. award as the best paper on coal or derived products.

of low-carbon content in a high-frequency electric furnace. About a 2-in.-deep layer of sized coke (¼ x 1/16 in.) was placed on top of the molten mass maintained at 1500° C for periods up to 3 hours. Molten metal samples were taken at frequent intervals and analyzed for carbon content.

This method appeared to have so much merit that the authors decided to use it in their foundry coke investigations. However, because of the desirability of having a laboratory-scale test using a small sample of iron and coke, as well as completing a test in a short time, the method described by Riley was modified to include these features. After some preliminary work, the procedure described in this article was evolved.

After development of a procedure, many cokes were tested. These cokes included those obtained in connection with foundry coke investigations, some typical commercial foundry cokes, some containing various additives and others to demonstrate the effect of such variables as ash content, silicon content, and type of carbon.

METHOD OF TESTING

Apparatus—The test is conducted in a 2-lb induction furnace (Ajax Electrothermic Corp. No. 3P2) powered by a 6-kw transformer and converter. The charge is placed in an alundum crucible of 2 in. ID and 3 in. deep (Ajax 3P2-A). A fused silica sleeve is placed inside the furnace adjacent to the coils. High-temperature insulation (crushed Johns-Manville 3000 brick or equivalent) is packed underneath the crucible and in the annulus between the alundum crucible and the silica sleeve. The top ½ in. of the annulus is filled with a high-temperature refractory cement. Water flows through the furnace coils and keeps the silica sleeve and exterior part of the furnace cool.

A platinum, platinum-rhodium thermocouple, whose bead is cemented to the outside bottom of the alundum crucible with Sauereisen P-78 cement, is used as a control on the temperature of the melt during the test. This thermocouple is calibrated by another platinum thermocouple, encased in a porcelain sheath. The latter couple is immersed in the melt at short intervals during the test to insure that the temperature of the molten iron is maintained at 1500 ±10° C. This procedure was found necessary so that the porcelain dissolved by the iron would not interfere with the results of the test.

SAE 1045 iron in the form of ¾-in. diam rods cut approximately 2 in. long is used as the standard or base iron. This iron had the following composition: Carbon 0.45 per cent, silicon 0.20 per cent, manganese 0.51 per cent, phosphorus 0.019 per cent, and sulfur 0.028 per cent. It was found especially important when using a new batch of iron that the silicon and manganese contents be near to the above values or significantly different results will be obtained when the same coke is tested.

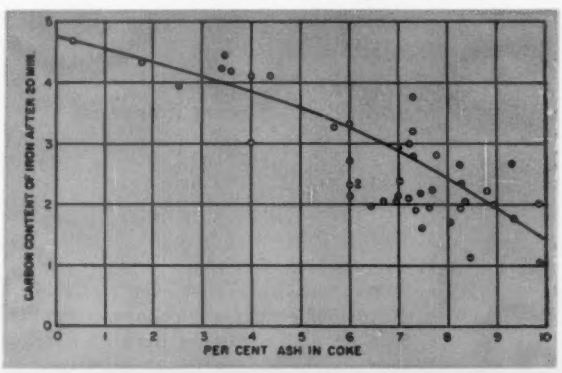
Porcelain tubes of approximately ¼ in. OD and ⅛ in. ID are used as sampling tubes for the melt during a test. They are cut into convenient lengths (10 in.) and a medicine-dropper bulb is placed on one end.

A mold fashioned from an insulating brick serves as a receiver for the hot metal on completion of a test. A depression in the face of the brick is hollowed out to a depth of approximately 1 in. and the pores in the depression are filled.

Test Procedure—Approximately 400 grams of iron is placed in the crucible and the furnace is covered with a suitable refractory cover. Power is supplied to the furnace and after the iron is melted (about 15 min) additional iron in about 100-gram portions is charged until a total of 950 grams is contained in the crucible. The immersion thermocouple is inserted and the temperature of the melt is adjusted to 1500 ±10° C. The control couple is read and maintained constant throughout the test at the reading corresponding to 1500 ±10° C on the immersion couple. There is usually about a 50° differential between the two couples.

After the temperature of the melt has been brought to equilibrium at 1500° C, the coke to be tested, sized 3 x 6 U. S. standard mesh, is poured on top of the molten mass to a depth of 2 in. or about even with the top of the crucible. No cover is placed at the top but the coke bed is maintained even with the top of the crucible. The test is timed from the start of the addition of the coke. Usually a test of one hour duration is sufficiently long to determine the carbon solubility characteristics of a coke. No agitation of the metal is necessary since the high-frequency current keeps the molten metal in fairly violent agitation. This agitation is sufficient to insure that a sample taken at any moment is representative of the total melt.

Fig. 4—Further demonstration of the relation of ash content to carbon solubility in iron



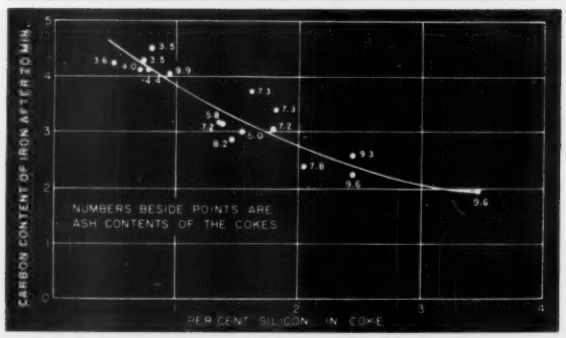


Fig. 5—Effect of silicon content of coke on the solubility of coke in iron

At intervals during the test (usually after 10, 20, 30, 40, 60 minutes), the melt is sampled for carbon analysis. The porcelain sampling tube, preheated in the coke bed, is plunged into the molten mass with the bulb depressed and then released. Upon removal of the tube and rapid cooling in air, cylindrical samples of iron ⅛ by 2 in. long are obtained by breaking away the tube wall. These samples are analyzed for carbon content.

On completion of the test, the molten metal is poured into the brick mold. It is extremely important that the mold be dry before pouring in the hot metal. Before the crucible cools down, it is scraped clean for the next test. As many as eight tests have been made in a crucible before it required replacing.

Preparation of Cokes—Some of the cokes tested for carbon-pickup properties were made in full-scale ovens under foundry coking conditions. Other cokes were prepared either in an experimental pilot-scale oven or in so-called box tests. In the latter, about 16 kg of the foundry coal mixture is carbonized in stainless steel boxes, 8 x 12 x 15 in. high, by placing these boxes in an experimental oven and carbonizing at foundry coking temperature.

Samples were prepared from the gross sample by crushing the latter in a jaw crusher through ½ in. and quartering the crushed product down to 3-5 lb. The 3 x 6 mesh size is prepared from this fraction by hand in an iron mortar with frequent screening so as to remove the desired size fraction as soon as it is made.

EXPERIMENTAL DATA

Reproducibility—Table I presents data on the degree of reproducibility of the carbon solubility test when conducted in the manner described above. Five different cokes were tested in duplicate, and the results cover a wide range of carbon contents.

TABLE 1—Reproducibility of the Carbon Solubility Test

Coke	Test	Carbon Content of the Iron After Various Contact Periods (minutes) 10	20	30	40	60
A	1	2.06%	2.35%	2.47%	2.56%	2.59%
	2	2.05	2.35	2.58	2.62	2.78
B	1	1.75	1.93	2.11	2.23	2.71
	2	1.62	1.87	2.08	2.35	2.69
C	1	0.72	1.17	1.40	1.55	1.91
	2	0.83	1.13	1.35	1.52	2.01
D	1	2.71	3.21	3.32	3.45	3.49
	2	2.68	3.00	3.44	3.65	3.82
E	1	3.47	3.83	3.88	4.01	4.04
	2	3.58	3.83	3.90	4.00	4.03
Average diff.—% C		0.08	0.06	0.07	0.08	0.13
Min'mum diff.—% C		0.01	0.00	0.02	0.01	0.01
Maximum diff.—% C		0.13	0.21	0.11	0.20	0.33

It is evident that the reproducibility, in general, is good. The over-all average difference is about 0.08 per cent carbon or about 1.6 per cent of the saturation carbon content of pure iron at 1500° C. The standard deviation for the above data is also 0.08 per cent.

Solubilities of Some Commercial Cokes—A number of samples of different foundry cokes were tested by the carbon solubility test and the solubility rate curves obtained are presented in Fig. 1. Considerable variation will be observed in the cokes tested, for carbon contents of the iron at the end of the test varied from about 2½ to 4½ per cent. The variation possibly may be more than shown, for only a few cokes were tested. An indication of the day-to-day variation in cokes can be observed in Fig. 2. In this chart several curves are shown of coke samples obtained from a single coal blend spaced over a period of approximately six months. Variations of about 1 per cent carbon may possibly be expected.

Effect of Impurities in Coke—To confirm the work of Riley[7] on the effect of ash content of the coke on the solubility of the latter in molten iron, solubility tests were made on four cokes ranging in ash content from 3.5 to 9.3 per cent. These cokes were all prepared from the same three-component coal mixture in box tests as described above. Each of the individual coals was cleaned separately by float-and-sink methods to the desired ash content; blends were made after cleaning.

Results of the solubility tests on these cokes are presented in Fig. 3. The effect of ash content is obvious, for reduction in ash content of the coke has progressively increased the carbon content of the iron, comparing after 20 minutes of test, from 2.6 per cent to 4.3 per cent. The change in the petrographic nature of the coals with washing and the resultant change in the type of carbon are not believed to be much of a factor in this case.

A further demonstration of the effect of ash content is shown in Fig. 4 in which the carbon contents of the iron after 20 minutes of test is plotted against the ash content of a large number of miscellaneous cokes. Even though cokes of a wide range of characteristics are represented,

Fig. 6—Effect of silicon content of iron on the solubility of coke in iron

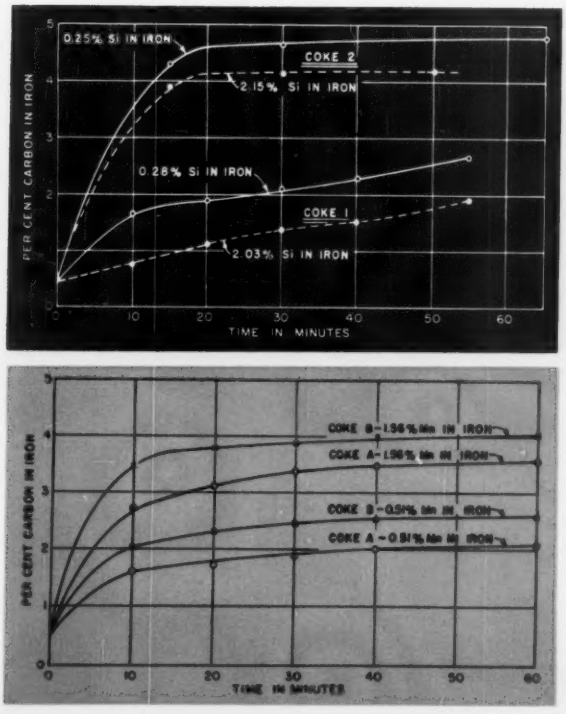


Fig. 7—Effect of manganese content of iron on the solubility of coke in iron

a fairly good correlation is indicated between coke ash content and carbon solubility in iron. The trend line shown passes nearly through 5 per cent carbon at zero ash content and through 1½ per cent carbon at 10 per cent ash content.

Sweetser[9] showed that in the blast furnace "silicon drives out carbon." This is confirmed in Fig. 5 in which the carbon-pickup is plotted against the silicon contents of many of the cokes represented in Fig. 4. Apparently, a good correlation exists between the two. This is not surprising, however, on the basis of the preceding figure, for silicon is the major component of ash and a similar correlation should exist.

The numbers beside the points in Fig. 5 are ash contents and, in general, the ash contents increase in going down the curve. There is one notable exception. The lowest point on the curve is for a coke (9.6 per cent ash content) made from a coal mixture to which 5 per cent sand was added; the carbon in the iron from this coke amounted to about 2 per cent. Near the other extreme of the curve, however, is a coke (9.9 per cent ash content) made from a coal mixture to which 5 per cent iron ore was added; the carbon in the iron from this coke amounted to about 4 per cent. This suggests the possibility of addition of iron ore to the coal mixture in order to improve the carbon-pickup properties of a foundry coke.

Effect of Iron Composition—As shown above, silicon in the coke retards the solution of carbon in iron. The effect of silicon in the iron was, therefore, tested also. The standard iron for the carbon solubility test contains about 0.20 per cent silicon. Two cokes were tested in a standard iron and also in standard iron to which about 2 per cent silicon was added in the form of pure ferrosilicon. Fig. 6 presents the rate-of-solubility curves obtained. For each coke the curves for the higher silicon irons are somewhat below those for the standard irons.

The effect of the manganese content of the iron also was tested. It was found by accident that manganese has a considerable effect on the rate of carbon solubility. Whereas in the past SAE 1045 standard iron was obtained from one source, a batch was obtained from a different supplier. After a number of tests had been made, it was observed that considerably higher solubilities were obtained. By process of elimination the difference in manganese content between the irons from the two different sources was found to be accountable. Chipman[4] and Turkdogan[10] have recently shown that this is true.

Fig. 7 shows the result of the present study. By increasing the manganese content of the iron from 0.51 to 1.56 per cent, the carbon content of the iron using Coke A had increased from about 2 per cent to 3½ per cent and for Coke B the increase was from about 2½ per cent to 4 per cent. These results suggested the addition of manganese compounds to the coal mixture, and the results of such a study are presented later in this paper.

Effect of Coking Time—A series of tests was made to determine the effect of carbonizing conditions, specifically coking time. The same foundry coal mixture was carbonized in full-scale coke ovens of approximately 18 in. in width at coking times of 17, 24, and 28 hours. Carbon solubility test data on cokes made at these coking times are plotted in Fig. 8. These results indicate that coking time has a slight effect on carbon-pickup. The longer coking times appear to be conducive to higher carbon solubility, although there does not seem to be much difference between the 24-hour and the 28-hour curves. Whether the greater carbon solubility is due actually to the longer coking times or to the lower attendant carbonization temperatures is not known.

Effect of Additives in the Coke—Riley[7] found that the presence of lime and an atmosphere based on air at normal pressure tended to increase the solution of carbon in molten iron. This improvement in carbon content was attributed to the formation of calcium carbide. In the present study, additions of 1, 2 and 5 per cent lime were made to a coal mixture and the cokes from each were tested in the solubility test. Fig. 9 illustrates the rate of carbon solution curves for these cokes. It will be observed that 1 per cent lime effected very little change over that of no addition. The addition of 2 per cent lime resulted in initial retardance of the rate of solubility, but after 40-odd minutes the same carbon content was attained as for the blank at the same time. For 5 per cent addition of lime, the rate of solubility of carbon remained low throughout the test. Thus the addition of lime was found to be of no benefit in this study.

Fig. 8—Effect of coking time on the solubility of coke in iron

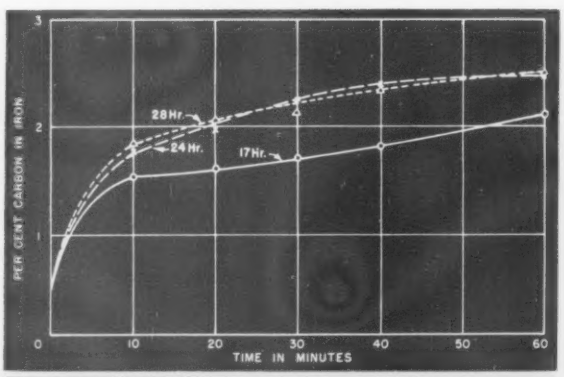


Fig. 9—Effect on solubility of coke in iron of lime addition to coal mixture

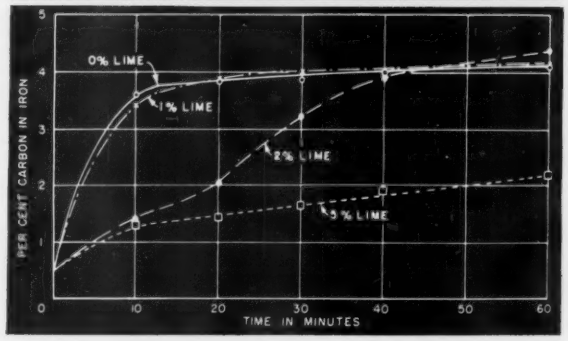


Fig. 10 presents the results of a similar study with the addition of soda ash to the coal mixture. In this case, 1 per cent addition of soda ash made no improvement in carbon content, but 2 and 5 per cent additions effected a considerable increase, from about 2½ per cent carbon to 3½-4 per cent carbon. These results, therefore, confirm those of Riley, although the latter obtained more improvement. The explanation offered for the increased carbon-pickup in the presence of soda ash is that the ash formed on the surface of the coke through combustion is fluxed by the soda ash. Thus the ash is sloughed off the surface of the coke so that carbon surface is presented more readily to contact with molten iron, with a resultant higher solubility of carbon in iron.

As shown above, high-manganese iron dissolves more carbon than does a low-manganese iron. The mechanism advanced by Turkdogan[10] for this behavior is that manganese carbides are formed. Fig. 11 presents the results of addition of ¼, ½, 2, and 5 per cent of manganese dioxide to the coal mixture prior to carbonization. Apparently, the addition of manganese to the coal mixture is beneficial in regard to carbon-pickup.

Discussion—It is believed that the method described has a great deal of merit for its intended purpose and fills the need for such a test for the coke producer and coke user. The study presented is not intended to be comprehensive in scope but is rather intended to demonstrate the possible usefulness of such a test to both the coke producer and the foundryman as a control method or a research tool.

The test presented is empirical and all data are relative provided the conditions of testing have not been changed. No attempts have been made to correlate results of the test with actual performance in the cupola. Such a correlation is highly desirable but comparative data were not available to make this study.

In the preliminary development of the test procedure, other conditions were tried. Using less iron, 450 instead of 950 grams, and 3 x 12 mesh coke instead of 3 x 6 mesh was found to be unsatisfactory. Higher carbon contents were obtained because of the somewhat higher ratio of coke surface to volume of iron. Even cokes that were poor carbonizers gave very rapid rates of carbon solutions, and as a result the overall range of carbon contents for a variety of cokes was somewhat smaller than for the same cokes tested by the present procedure.

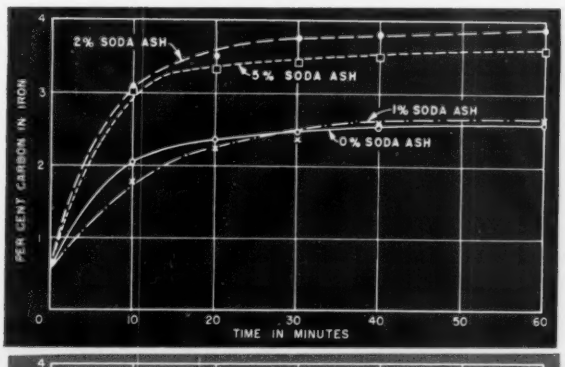
This study has shown that ash content of the coke or its major constituent, silicon, has a significant inhibiting effect on carbon solubility in the iron. In addition, the type of iron apparently is instrumental in the amount of carbon-pickup. It was demonstrated that admixtures of various materials with the coal mixture prior to carbonization can also significantly affect the amount of carbon dissolved. Soda ash and manganese dioxide were found to be effective agents.

Correlations were attempted with such properties as the wet oxidation index[1, 2], which is said to be a measure of the amount of graphitization undergone by the coke, and with ash fusion temperatures. No satisfactory relationships were obtained. Intentional addition of 2 and 5 per cent graphite to a coal mixture resulted in no appreciable improvement in the solubility characteristics of the coke.

The softening temperature and the fluid temperature of the ash of coke also presented no significant correlation. However, cokes having an initial softening temperature of less than 2400° F exhibited relatively high carbon solubilities. When the initial softening temperature of the ash exceeded 2400° F, the solubility of carbon in iron decreased appreciably.

Acknowledgment—The authors are indebted to H. G. Meredith of the Koppers Co. Inc., on behalf of the Gas and Coke Division who sponsored the work on the development of the test method. The authors are also indebted to G. V. McGurl, under whose direction the work was done, and to H. B. Smith, who did much of the preliminary development of the method.

Fig. 10—Effect on solubility of coke in iron of soda ash addition to coal mixture



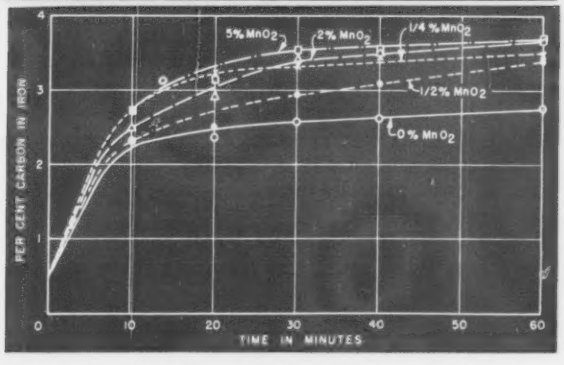


Fig. 11—Effect on solubility of coke in iron of addition of MnO_2 to coal mixture

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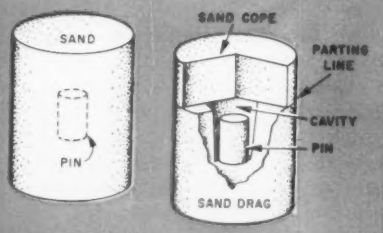

Fig. 1—Work by Savage and Taylor[5] concerned a test in which a steel pin was imbedded in a standard AFS test specimen and melted by induction. Details of specimen preparation are shown here

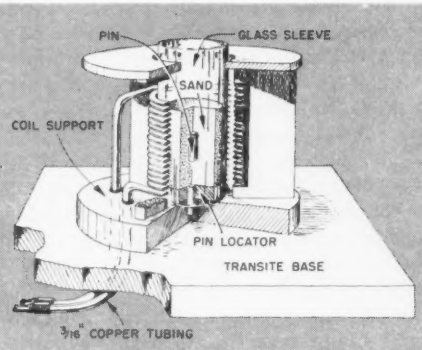

Fig. 2—A cutaway sketch of the furnace

MOLD-METAL INTERFACE REACTIONS

The authors present here a theory for interface control which is basic enough to explain observed phenomena in the fields of investment casting, conventional sand mold processes, and metal oxidation

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DIMENSION accuracy and surface finish of investment castings are determined by characteristics of both metal and mold, and are limited particularly by chemical or physical changes in the mold resulting from the intimate, sudden presence of molten metal.

Although specific research described in this paper is in casting processes other than investment casting the principles discussed are basic. For example, several factors determine how well molten metal will "lie to" the walls of the refractory mold, whether or not a reaction will occur, and the nature and extent of any potential reaction. These are: Temperature at the interface, composition of metal and mold, length of time the interface is above a critical temperature, static and/or kinetic energy of metal at rest or filling the mold, particle size and packing density of the refractory, surface tension of molten metal against gas or refractory, and the atmosphere at the interface.

Although all factors are not common to the different casting processes and some are modified by the characteristics of a particular process, there are controlling areas of overlap. In other words there are many ways in which castings made by green sand methods and by investment processes are similar as regards interface behavior.

Types of Interface Reactions—Mold-metal interface reactions can be categorized as: 1. Those depending upon mechanical behavior of the mold such as scabs, buckles, and veins. 2. Those more physical in nature, such as metal penetration. 3. Those interactions which are strictly chemical.

Casting defects due to mechanical failure of the mold result from thermal expansion of the refractory or abrupt generation of gases in the mold. For example, veining (in contrast to metal penetration) is due to a property of aggregate system molds to expand under pressure. In a bonded mixture this expansion usually occurs by movement of a line of mold particles which opens a path for metal to flow and fill.

Physical interaction involves metal penetration. Other things being equal, and assuming there will

Fig. 3—Specimen and furnace before test

be no secondary effects due to formation of an oxide film on the metal surface, metal penetration into the mold is controlled by the metallostatic pressure, pore diameter, surface tension of the metal, and liquid metal temperature. Complications such as formation of surface oxide, apart from masking the true surface tension of the metal, may lead to production of a slag in the metal-mold interface by reaction with the molding material. The surface tension of the molten metal in contact with the slag may be different from that in contact with the solid phase of the mold, and unexpected results may be obtained. However, such possible complications apply to the chemical type interaction better than to the physical type.

Although literature dealing with physical type reactions is not as abundant as that dealing with the mechanical type, several good papers on the subject have been written.[1, 2, 3, 4]

Chemical reactions have been least studied of all and, in the authors' opinion, may be the most important. The chemical reaction of hot metal with the refractory mold can be categorized as: 1. Reaction of the metal with volatile mold products resulting from moisture, mold dressings, atmosphere, etc. To this type reaction belong problems such as casting surface unsoundness, and prevention of these defects by addition of inhibitors to the metal, to the sands, or to both. 2. Reaction of the metal with nonvolatile mold materials which control, with factors listed under physical interactions, the phenomena known as metal penetration, sand adherence, burnt-on sand, etc.

This paper deals with the latter type of chemical mold-metal reaction. The aim is not to solve the problem of penetration or to provide new results. It is to analyze available data and the role mold metal reactions play in the general mechanism leading to sand adherence and to emphasize the need for further research in this field of foundry technology.

Experimental Research — Literature describing chemical mold-metal reactions is scanty. One of the few contributions was made by Savage and Taylor;[5] their work concerned a test in which a steel pin was imbedded in a standard 2 in. long by 2 in. diameter AFS standard sand test specimen and melted "in situ" by induction. Fig. 1 gives details of specimen preparation, Fig. 2 is a cutaway sketch of the furnace, and Fig. 3 shows the specimen and furnace preparatory to testing.

Purpose of the experiments was to reproduce chemical reactions occurring when molten steel is poured into a sand mold. By melting the metal pin rapidly, conditions at the mold-metal interface were expected to be similar, if not identical, to those ensuing in practice. To prove the analogy, samples of sintered sand, such as that of Fig. 4, were obtained from industry and compared by X-ray diffraction analysis with reacted interface material obtained in the so-called sinter pin test. The reaction products of the shop and laboratory samples were identical, showing production of fayalite in both cases. Fig. 5 is a photograph of several sinter pins after melting or heating to nearly melting. Table I describes conditions under which the sinter pins were reacted.

The work ended with full realization of its objectives but funds were not available to continue the study of how mold-metal interface behavior could be altered and/or controlled by chemical or physical additives to the sand or by changes in the atmosphere of the mold. A few tests were made to those ends, and it was evident the work should be continued, as some rather startling results were obtained.

Chemical Mold-Metal Reactions—In considering the interaction between mold and metal at the interface, it is necessary to consider these variables: Base metal (M_1), alloying additions (M_2, M_3...), oxygen (O), refractory oxides (RO), and the high temperatures involved.

The three reactions which may occur among the variables are:

1. $M_{1,2,3\cdots} + O\text{-----}M_{1,2,3\cdots}O$
2. $M_{1,2,3\cdots} + RO\text{---}M_{1,2,3\cdots}O + R$
3. $M_{1,2,3\cdots}O + RO\text{-----}M_{1,2,3\cdots}O.RO$

The extent to which these reactions proceed determine the interface behavior between mold and metal and the excellence of the casting. Let us consider each reaction separately.

Reaction 1

$$M_{1,2,3} + O \ldots . M_{1,2,3\cdots}O$$

Surface oxide on a molten alloy generally is that of the constituent with the greatest affinity for oxygen; an approximate measure of this affinity is given by the heat of oxidation. In comparing different metals the heat of oxidation should be considered in terms of the heat released per gram atom of oxygen. When small differences exist between the heats of oxidation the free energy of formation of the oxides combined must be considered. Even if one constituent of the alloy is present only in small proportions, its oxide will predominate in the surface film if its affinity for oxygen is sufficiently high. This reaction, arising from the moisture, pore spaces in the mold and diffusion from the atmosphere, is controlled by the available

oxygen and the nature of the oxide formed. Pilling and Bedworth[6] showed that the kinetics of oxidation of solid metals is governed by the ratio between the volumes of the oxide formed and that of the metal from which it was formed. This ratio is known as the Pilling-Bedworth ratio. If it exceeds unity and the surface of the metal thus becomes covered with a compact and continuous film of oxide, diffusion either of metal ions outward or of oxygen atoms inward is likely to be the rate-controlling process, and the rate of oxidation diminishes with time according to the parabolic relation $w^2 = Kt$, where w is the weight of oxide and t the time.

When the Pilling-Bedworth ratio is less than unity and the oxide does not occupy sufficient space to cover the metal surface, oxygen has direct access to the metal through cracks in the film. Diffusion no longer is the rate-controlling process. Under this condition a linear relation holds between time and oxidation.

Relationships Are Not Always Simple—In some cases the oxidation rate of solid metals does not conform to either of these simple relationships. For example, if the Pilling-Bedworth ratio is considerably greater than unity, the oxide film is subject to compressive stresses. If these fracture the film, the oxidation rate is expressed by more complex relations. An example is the logarithmic oxidation laws discussed by Evans.[7] Similarly, if the Pilling-Bedworth ratio is considerably greater than unity, the oxide films apparently can withstand considerable tensile stress under some conditions Then the expected linear oxidation law is not found. However, departures from the parabolic and linear oxidation laws are uncommon at temperatures near the melting point and these two laws control also the oxidation of molten metals and alloys, as has been shown by Delavault.[8]

Therefore, it is possible to suggest conditions required for the occurrence and prevention of the mold-metal oxidation reaction: The constituent in the alloy with the greatest affinity for oxygen must have an oxide with a Pilling-Bedworth ratio less than unity for the reaction to occur. To inhibit the reaction an element with an even greater affinity for oxygen than that causing the reaction must be added. This added element must have a Pilling-Bedworth ratio exceeding unity.

Fig. 4—Samples of sintered sand were identical to interface material from Savage-Taylor test

In other words, to inhibit reaction the oxide film must be replaced by one of a different compound whose ratio exceeds unity. These conditions may be complicated by additional factors. Because of falling temperature the system under consideration is a nonequilibrium system. Respective concentration of alloying elements and their diffusivity and in some cases the solubility of the oxide formed in the base metal complicate the issue, as in the case of copper and iron. Sometimes the film-forming substance may react with another to produce a liquid slag; this occurs in alloys containing copper or silicon, which oxidize to give acidic oxides. Complications, owing to the fluid nature of the film-forming substance, will be more likely to occur in alloying systems of high melting points.

Reaction 2

$$M_{1,\,2,3\,\ldots} + RO \text{----} M_{1,\,2,\,3\,\ldots}O + R$$

When a molten metal is in contact with a solid oxide such as silica, alumina, magnesia, etc., the reaction between molten metal and the oxide may penetrate the oxide or remain superficial. However, for the reaction to occur at all it is necessary that it be thermodynamically possible.

Trombe and Foex[9] found that penetration of metal at the temperature of the experiment is controlled by relations similar to those which control metal oxidation. Thus if the ratio B/A—where B is the volume of the compound (insoluble in the molten metal and nonvolatile) formed by the reaction, and A is the volume of the original oxide consumed during the reaction—is greater than unity, the reaction generally will stop soon due to the formation of a continuous protective crust arising from fixed products of the reaction. If the B/A ratio is less than one, the protective crust on the metal surface will exhibit a certain number of cracks through which the molten metal will be forced by atmospheric or by metallostatic pressure. The reaction ultimately may reach all the metal.

However, even when B/A is less than one, metal penetration in the porous refractory can be slowed down or completely stopped. This may be due to establishment of the same pressure on both sides of the surface, either by transmission of atmospheric pressure through the refractory or by pressure of gas in the intergranular voids. It also may be inhibited by too high surface tension of the metal, which prevents penetration inside crevices of the crust to deter reaction with the oxide.

In a general case of molten metal attack on refractories with B/A less than one, metal penetration is more rapid the smaller the value of B/A.

Reaction 3

$$M_{1,\,2,\,3\,\ldots} \quad O + RO \text{----} M_{1,\,2,\,3\,\ldots} \quad O.RO$$

This is the more complex reaction of the three because it depends on Reactions 1 and 2. It is controlled by the equilibrium condition and the reaction rate. If the equilibrium condition for the combination of metal oxides and refractories produces no material melting at a temperature lower than

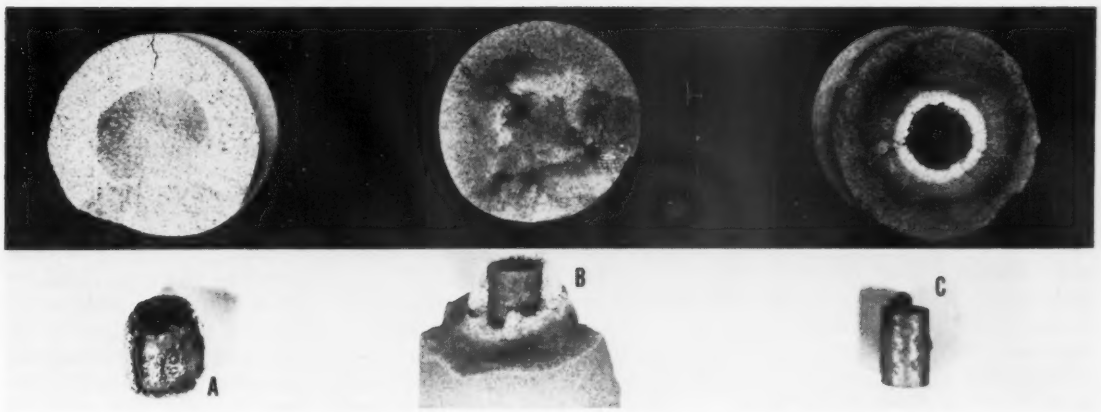

Fig. 5—Photograph of sinter pins after melting or heating to near melting

TABLE I—Conditions Under Which Sinter Pins Were Reacted

Test Conditions						Sand Characteristics			Sand Additions		
Specimen	High Frequency Amperes	Heating Time in Minutes	Number of Rams	Atmosphere	Pin Type	Type of Sand	Sand Grain Size, U. S. Screen No.	Mold Type	Bentonite Percent	Water Percent	Loss in Weight Percent
A	103-5	3½	3	Air	1040 steel	New Jersey silica angular grains 30-2	+70 −50	Dry	3.0	4.0	1.0
B	103-5	3½	3	Air	1040 steel	Zirconium silicate	Commercial grade	Dry	3.0	4.0	+0.4
C	103-5	3½	3	Air	1040 steel	Zirconium silicate	Commercial grade	Green	3.0	4.0	1.2

that at which the refractory is maintained, there can be no serious reaction. However, if the volume of compound formed is smaller than the combined volumes of the reactants, the reaction will go on through the cracks and crevices of the solid crust formed between the two reactants until the equilibrium condition is reached. This is the case, as reported by Trombe and Foex[9], for Li_2O and SiO_2 in the reaction of liquid lithium in contact with silica glass.

If the interaction is possible, either because of the favorable ratio of the volume of the products formed or because at the temperature of the experiment the product of the reaction is liquid, the rate of reaction depends upon the temperature. This factor is very important. In many instances an increase of only 18° F may be enough to double the reaction rate. A further factor of importance in the kinetics of the reaction is the diffusion through the molten interface. Very little is known about the rate of diffusion of substances at high temperatures, but this effect is quite important in bringing the reaction substances together. The rate of diffusion is proportional to the viscosity and, therefore, depends largely upon the temperature of the reaction.

According to the above consideration the conditions to promote reaction are:

1. An oxidizing atmosphere, because SiO_2 is thermodynamically stable except in contact with Al, Mg, Ti, Zr, and Li. For Reaction 3 to occur, the presence of a metal oxide, preferably liquid, was required at the temperature involved.

2. The volume of the reaction products should be smaller than the products of the reactants and preferably liquid and insoluble in the reactants.

3. Because of the low diffusivity of the oxides in the slags, a reasonably long time is required, and the prevailing temperature should be high.

On the other hand, conditions to prevent mold-metal reaction should be:

1. A neutral or reducing atmosphere. When alloying elements consist of metals that may displace Si from its oxide, the alloying elements, preferentially oxidized, should have a B/A ratio greater than one.

2. Under oxidizing conditions the metal oxide should be such that it will react with the refractory oxide giving a solid slag with a B/A ratio greater than one.

3. Rapid cooling of the interaction surface.

Let us consider now the several stages that steel undergoes during solidification in contact with mold walls.

The Reactions of Steel—Steel undergoes several stages during solidification in contact with mold walls. The first reaction is a preferential oxidation of carbon, silicon, manganese, and iron in the order given. Carbon gives a volatile oxide and does not take part in the reaction. While the metal is still liquid, silicon and manganese will oxidize forming a liquid slag. The failure to find rhodonite ($MnSiO_3$) in appreciable amounts (as reported by Petterson[4] and by Savage and Taylor[5]) strongly supports the theory that mold-metal reaction occurs mainly after the steel has solidified,

therefore hindering the diffusion of silicon and manganese to the mold-metal interface. Experimental evidence of this has been provided by Savage and Taylor.[5] See Fig. 6. These investigators bled castings by inverting the mold 30 seconds and 3.5 minutes after pouring. They showed in the first instance that sand grains sticking to the casting were not discolored and were locked so tightly to the casting that even sand blasting would not remove them. Mechanical penetration had occurred but no mold-metal reaction product had been formed. In the second case the sand had turned black to a considerable depth, the sinter layer shearing automatically from the casting.

That this should happen as described is only natural at the temperatures of the interface. According to Pellini and coworkers,[10] on large steel castings 7 x 7 in. in cross section, the mold temperature at the interface rises to 2550° F after 5 minutes and remains almost constant at that temperature for 25 minutes. The temperature of the metal interface, after the same interval of time varies only from 2600 to 2550° F. As the liquid oxide is stable to temperatures of 2510° F, the first condition which will promote mold-metal reaction exists.

The reaction $2FeO + SiO_2 = 2FeO \cdot SiO_2$ starts at 2510° F, giving a liquid iron silicate slag that finally will solidify as a layer of fayalite between the two phases. This layer accounts for the good peelability encountered.

Summary—Conditions are found in medium size steel castings that promote mold-metal reaction. The slow rate of cooling of the interface provides adequate time and temperature for the liquid iron oxide to react with silica probably giving a liquid iron silicate with a B/A ratio less than 1. The reaction proceeds as long as the temperature is favorable, dissolving iron from the metal and silica from the mold interfaces. In parts of the interface where the ratio of surface area/volume is greater, the reaction will proceed more rapidly, so the final surface tends to be free from irregularities. As the reaction is rather slow, the production of an interface layer is prevented in castings in which the rate of cooling is too rapid due to size or some other factors.

Following the same analysis as above, reducing or neutral conditions should prevent mold-metal reaction. This was proved by the experiments of Savage and Taylor.[5] Also in overdeoxidized steel, poured at high temperatures, little mold-metal reaction would be expected due to the preferential oxidation of aluminum to aluminum trioxide. The eutectic point of mullite (alumina-silica slag) is very high (above 2600° F) so even if the ratio B/A is less than one, reaction would be reduced.

Lack of data on the densities of several oxides and silicates make it difficult to predict behavior at the mold-metal interface, or to choose a set of conditions for casting that will channel reactions in a preferred and predictable direction.

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This article is based on a paper presented by Prof. Taylor at the Investment Casting Institute's fourth annual meeting in Detroit last year.

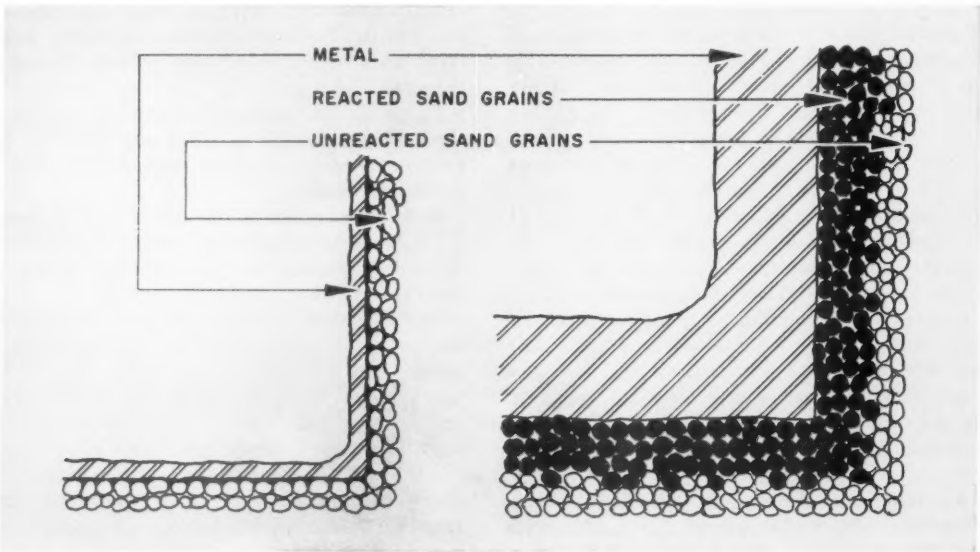

Fig. 6—Left, casting bled 3 seconds after pouring. Right, casting bled 3½ minutes after pouring. Mold-metal reaction occurred in latter

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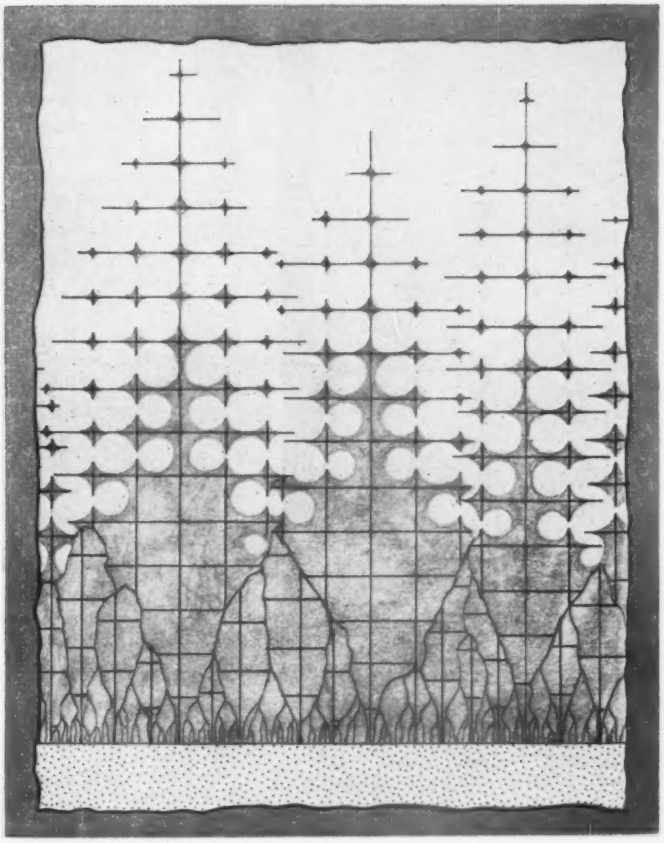

Fig. 1 — Showing dendritic growth in tin bronze. The dendrites grow inward from the mold surface rapidly, but with comparatively slow solidification between main, secondary, and tertiary axes

Shrinkage in Tin Bronze Castings

First article in series explaining the behavior of tin bronzes, causes of defects, and methods for overcoming the difficulties

TIN BRONZES, as a family, long have held an important position as foundry materials for the manufacture of parts for engineering purposes, especially for piping systems subjected to considerable pressure and certain corrosive media, for heavy duty bearings, and for other machinery and structural parts where their special properties offer advantages. Because of occasional shortages of tin and its high present cost, attempts have been made, often successfully, to use other types of alloys for purposes where tin bronzes previously had been specified. There are certain areas of use, however, where no other metal has been entirely satisfactory and the use of tin bronzes probably will continue.

The large incidence of leakers in tin bronze castings for pressure applications has been instrumental in the attempt to substitute other types of alloys. Porous areas have shown up chiefly in those locations where heavy sections have been involved or where machine work has resulted in heavy surface cuts or the drilling and tapping of bolt holes. This leakage manifests itself under hydrostatic, air or other pressure tests and appears as slight seepage in most cases, but can also occur as heavy leakage, often under fairly low pressures. If such leakage could be avoided, foundry rejections would be much lower than is normally the case. Furthermore, complete avoidance of this defect would introduce still greater savings in the case of the manufacturer who, after machining an apparently sound casting, finds that the finished part leaks and must be rejected. Of course the leaking casting would

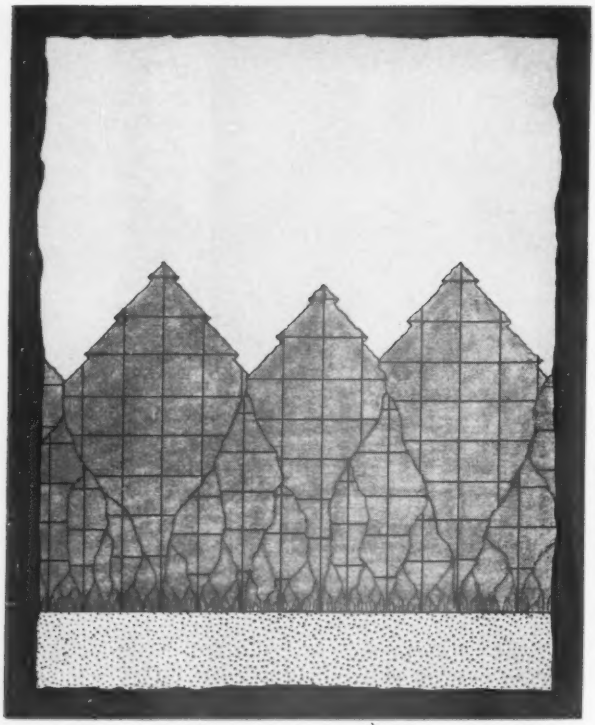

Fig. 2—Normal dendritic growth, in which dendritic branches grow rather slowly and metal tends to solidify in the body of the dendrites

be replaced by the foundry, but the cost of all labor expended upon it could not be recovered. This cost often amounts to several times that of casting.

The writer experienced one case where, if completely sound castings could have been obtained, the manufacturer could have paid eight times as much for the castings and still break even on his production costs. Peculiarly, after the foundry changed its methods to give greater assurance of sound castings, cost of the new production method was lower than that of the old one, not taking into account savings resulting from the lower rejection rate at the foundry. This instance is cited as one case among many where improvement in foundry techniques results in savings to both the foundry and the castings buyer.

Castings Production Is a Science—Purpose of this series of articles is to explain the reasons for the peculiar behavior of tin bronzes, to indicate causes of many of the defects, and to offer methods for overcoming the difficulties. Over the past 30 years sufficient information has been published which, if thoroughly sorted, digested, and applied to the manufacture of castings, should increase the science of foundry technology. In other words, the foundryman now should be able to have almost any casting designed, molded, and the metal melted and poured in such a manner that, barring certain unforeseen accidents in these operations, the necessary soundness should be obtained the first time that the pattern is "put in the sand," eliminating almost entirely the need of cut and try methods. Such assurance of obtaining good castings the first time will lessen materially the need for pattern changes, lower the amount of rejects and result in lower costs. Customers are demanding higher engineering properties and quality in castings. Foundrymen must be able to meet these increased demands or parts will be made by some other means, regardless of whether a sound casting would serve the intended purpose better.

Tin bronzes, as mentioned above, are prone to interdendritic shrinkage which may occur in thin sections but tends to become more pronounced as the section thickness increases. It is almost certain to occur to some extent in any casting having a wall thickness of four or more inches. Interdendritic shrinkage usually manifests itself as microscopic cavities extending between the individual grains or dendrites. In many cases, these cavities are interconnected, forming channels completely through the casting and along which fluids may flow. Usually these cavities are not apparent upon a machined section. They can be detected under the microscope or will show as darker areas indicative of low density upon an x-ray negative.

Basically, these cavities result only from incomplete feeding of liquid metal between the solidifying dendrites. On the other hand, this incomplete feeding can result from a number of causes which may include incorrect molding methods and improper melting conditions, both of which will be intensified by and will, in turn, intensify the peculiar solidification characteristics of the metal itself. Because of these peculiar solidification characteristics which were described to a certain extent by the author[1] and later more thoroughly by Bishop and Pellini[2] it becomes necessary with tin bronzes more than with most metals to take great care in melting and to provide ideal solidifying conditions if pressure-tight castings are to be obtained.

Solidification Characteristics — As pointed out by Bishop and Pellini[2] and the writer[1] tin bronzes tend to solidify with a rapidly advancing front. That is, the dendrites grow inward from the mold surface very rapidly, the main axes, also the secondary and the tertiary axes growing very rapidly, but with comparatively slow solidification between the axes. As a result of such growth, the dendritic skeletons meet within a very few seconds, offering high resistance to the flow of liquid metal past them and into the interior of the dendrites. This type of growth is indicated in Fig. 1 as contrasted to that of normally solidifying metal, where the dendritic branches grow rather slowly, and the metal tends to solidify in the body of the dendrites as indicated in Fig. 2. In both of these figures the mold is represented by stippled areas, the molten metal is white, the dendritic axes are shown as straight black lines, and the solid metal by solid gray shading.

Furthermore, tin bronzes solidify from the branches in thin metallic membranes which tend to form cubical cells, the walls of which will ob-

struct the flow of feed metal. If these cubical cells form completely, and sufficient pressure is lacking to break the membranous walls, metal within the cells will solidify with small, round cavities. Such cavities form a definite pattern, lying as they do between the branches of the dendrites, which can be seen under a microscope. Fortunately these cavities, although reducing the density slightly, will do no harm provided they are well dispersed in such a pattern that a number of them do not form a continuous line.

Types of Dendritic Formation—It is axiomatic that solidification can occur only if heat is withdrawn from the mass of molten metal in a mold. Normally, heat is removed through the mold material and to a lesser extent to the air contacting the risers. If heat withdrawal could be limited to the molding material and heat loss in air eliminated, one of the problems would be solved almost automatically. No complete solidification can occur until the metal temperature falls below the melting point. With a pure metal, this point is at a definite temperature, but with an alloy there is a certain temperature range, at the top of which solidification starts but is not complete until the lower end of the range is reached. Within this range exists a mixture of completely solid metal crystals in a bath of completely liquid metal. From a practical point of view even a pure metal would solidify over a period of time because it is impossible for the whole mass of metal in a mold to be at a uniform temperature.

When liquid metal is poured into a mold at room temperature, the cold mold begins to withdraw heat immediately, resulting in a thin skin of solid metal over the mold surface. Because the cold mold picks up heat rapidly, fine dendrites grow rapidly in the skin. Primary axes of the dendrites are perpendicular to the mold face, and growth is inward with some dendrites growing faster than others. As the mold becomes hotter it withdraws heat from the metal more slowly and solidification of the metal is slowed.

The slowing up of solidification and the nonuniform growth of dendrites inward from the mold wall results in formation of larger and fewer dendrites, all growing inward but having a long, narrow, columnar shape. These columnar grains continue to grow until liquid feed metal in the casting interior is exhausted or their growth is stopped by contact with other dendrites. If the wall is not too thick, the columnar growth will continue until columns from opposite sides of the mold meet at the thermal centerline of the casting. This is ideal dendritic growth but cannot take place in heavy casting sections.

Heavy Sections Are Hard To Feed—In heavy sections columnar growth continues until liquid metal at the center is of nearly uniform temperature throughout, and the metal walls have heated to nearly the melting point. Then the remaining liquid metal will cool slowly and uniformly. When the temperature reaches the point where solidification commences, dendrites begin to form throughout the liquid mass, each tending to throw out three axes each of which grow at the same speed in opposite directions from a nucleus. These nuclei are called equiaxed grains. In a comparatively short time the center of the casting will be filled with clusters of dendritic skeletons having a random orientation. As soon as the space not occupied by columnar dendrites becomes filled with equiaxed grains, further feeding becomes difficult or impossible. This is the reason for the difficulty in making completely sound, heavy-walled castings from tin bronzes. Heavy walls should be avoided, if possible, in designing castings to be made from these metals.

Fig. 3 is an X-ray radiograph of a $\frac{1}{8}$-in. cross-sectional slice from a solid gun metal casting and shows the chilled skin and columnar crystals as white areas on the two sides of the casting. The interior is filled with equiaxed grains many of which show the dendritic axes. This central portion has a lower density than the sides as indicated by the darker color in this location. Many metal discontinuities are apparent. It is evident that the center portion of this casting failed to

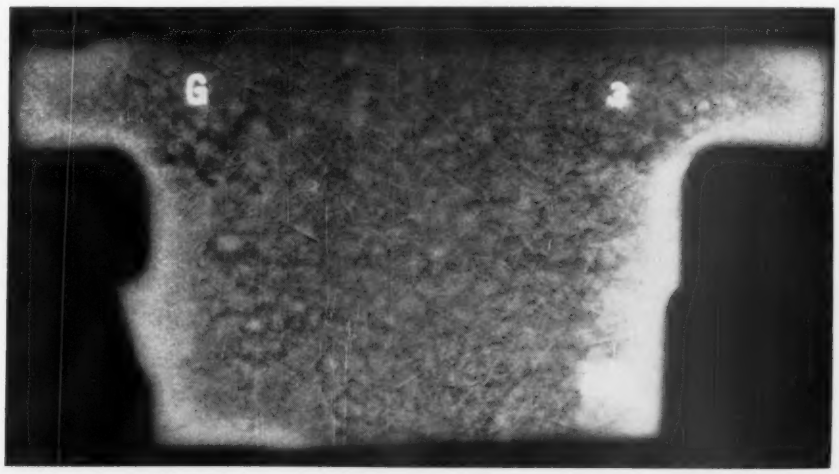

Fig. 3 — X-ray radiograph from a solid gun metal casting showing porosity in the center due to equiaxed grains

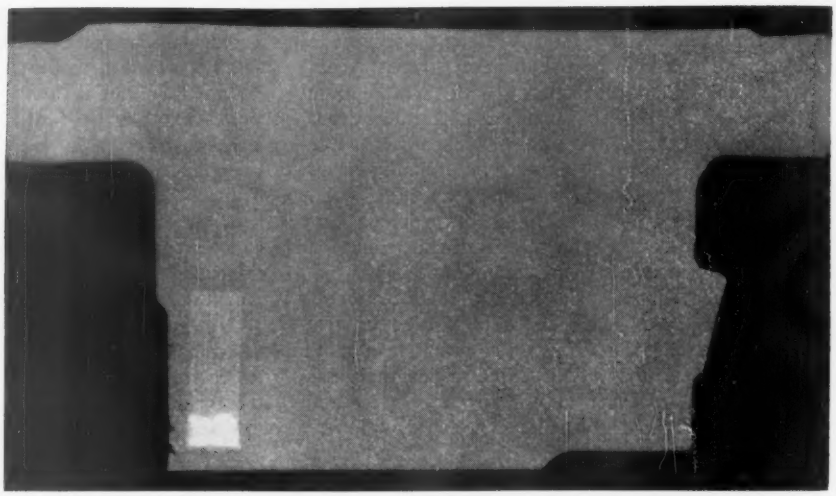

Fig. 4 — X-ray radiograph of an aluminum bronze casting shows absence of internal shrinkage. This casting was made from the same pattern as (Fig. 3) gun metal casting shown previously

feed even though the riser had a diameter considerably larger than the body of the casting.

This condition should be compared with that shown in Fig. 4 which is an X-ray radiograph of a ⅛-in. section from an aluminum bronze casting made from the same pattern, using the same risering. Aluminum bronze solidifies in the normal way with slowly advancing dendrites. This casting shows none of the internal shrinkage nor any reduction in density present in the gun metal.

To insure obtaining the necessary casting integrity, the wall thickness of a tin-bronze casting should not exceed that which will permit the formation of a chilled skin and columnar crystals. It is possible, by varying molding and pouring techniques, to increase this thickness somewhat. Such methods include chilling heavy sections, making the casting in an all chill mold, or using a sand with increased heat conductivity and capacity. Zircon sand which conducts and removes heat quickly should permit casting considerably thicker sections without obtaining the central, equiaxed grains. Lower pouring temperatures also have an advantageous effect by permitting increased thickness of the columnar wall.

How To Obtain Sound Castings — There are three conditions which must be met if a sound tin bronze casting is to be obtained:

1. The part must have a castable design. That is, it should contain no sections or shapes which are inherently impossible to feed. Heavy walled castings, such as the one illustrated in Fig. 3 may be considered as "inherently uncastable" in so far as the bronzes are concerned. Other designs, such as valves with exceptionally heavy flanges also fall into this category. The seats of valves, especially those of globe valves, often are made heavier than necessary. The greater mass actually may weaken the part. Although most of them can be produced with complete internal integrity, such soundness can be obtained only with difficulty and by using uneconomical procedures. On the other hand, many of these castings could be made with considerable economy if they were redesigned.

2. Correct molding techniques must be used. Completely directional solidification must be obtained. Nothing should be left to chance when completely sound castings are required.

3. Perhaps the most important requirement is that correctly melted metal be supplied at optimum temperature for the particular job. All molten metal, and especially the tin bronzes, must be free from gas when poured into the mold. A gassed bronze can not produce a sound casting regardless of the design or the use of correct molding procedures.

Gases in Tin Bronzes—Assume that the metal being poured into the mold is gas-free, no gas is picked up as the metal flows into the mold, and venting is sufficient to permit expulsion of all air contained in the gating system and the mold cavity plus any gases which might be formed when hot metal contacts the mold surface. Under such ideal conditions, the contraction in volume during solidification would tend to form a vacuum between the dendrites and branches as these grow out into the molten mass in the mold cavity. This vacuum, plus atmospheric pressure on the surface of the risers should force the still molten metal between the dendritic branches, providing complete feeding to final soundness of the casting.

When the dendritic branches formed during solidification becomes quite thick, feeding becomes more difficult. Fortunately these axial branches are fairly weak at the time they are first formed and can be broken easily by the external pressure and thus open up channels for the flow of liquid metal. Such breakage will, however, require the full weight of the atmosphere on the top of the risers. These, in turn, must be kept open to the atmosphere as long as molten metal is present in the mold cavity.

If the molten metal contains dissolved gas, solubility of the gas decreases as the metal cools with the result that the gas is evolved. Most

gases are only slightly soluble in solid metal, but are fairly soluble in molten metal. Consequently, at the instant that any metal solidifies, a certain amount of gas is formed within the body of the freezing metal. This gas evolution continues as long as solidification continues.

The Effect of Hydrogen — Hudson[3] gives the actual solubility of hydrogen in 100 grams of copper as: 2 cc at the solidus, 5.3 cc at the liquidus, and 10 cc at 212° F above the liquidus.

In other words, sufficient copper to make a cylinder slightly less than 1 in. in diameter and 1 in. long, will, when only partly gassed, evolve somewhat more than ¾ cu. in. of hydrogen between the times when it starts to freeze and becomes completely frozen. If this gas could be held entirely within the mold itself, tremendous pressures could be built up. When the dendrites first form there will be only slight hindrance to passage of this gas up through the mold cavity. But as the dendritic skeletons grow and tend to fill the mold cavity the spaces between the dendritic branches soon become small enough to prevent the flow of metal inward, passing that of the gas outward. At this time, the gas already between the dendritic branches prevents metal from flowing in to fill the interdendritic spaces. The result will be a series of microscopic voids or channels between the dendrites and reaching between the dendritic branches themselves.

When the amount of evolved gas is high, these channels can extend for considerable distances inward, often completely crossing the mold cavity and, in some cases, form a widely spread network of interconnected channels. This network of channels often will permit leakage completely through the casting wall, in some cases through the chilled skin. In other cases fluids can enter the casting at one point, travel considerable distances inside the casting, and come out at some point on the same wall or on the opposite wall a considerable distance from the spot where they entered. It is easy to understand how the casting will be especially prone to leakage if both surfaces of the casting are removed by machining, or how fluids can find their way out through holes drilled through the casting.

Fig. 5 shows a rather idealistic formation of these interdendritic channels. The chilled skin should be comparatively free from such channels. First of all, because of the almost instant freezing, this skin may retain considerable gas held in solid solution in which case it would cause no harm. On the other hand, a comparatively large volume of gas could be set free at this point and would have no difficulty passing inward into and through the still molten metal. When the first rapid cooling is over, and the rate of solidication has slowed down, permitting growth of the larger columnar dendrites, the volume of emitted gas may increase, making its elimination more difficult.

As solidification continues and the columns grow inward, more and more gas is evolved and the interdendritic channels will become larger. This increase in size is aggravated in the area of equiaxed grains if these form in the interior of the casting wall. If the gas evolution is slight, an overall shrinkage of the casting interior will result, all shrinkage areas being too small to be seen except under a microscope. With greater gas evolution, however, a point may be reached below the casting surface where the gas volume builds up sufficiently to form founded holes, which are the well known subsurface pinholes. With still greater quantities of gas, large rounded holes will form, often occupying most of the space between the casting walls. In any case, gas evolution will prevent much or all piping in risers and may even purge metal from the risers.

(To be continued)

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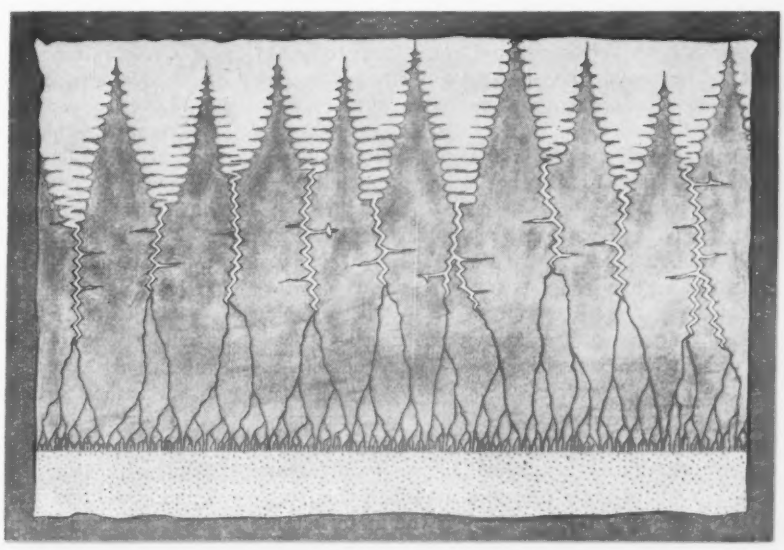
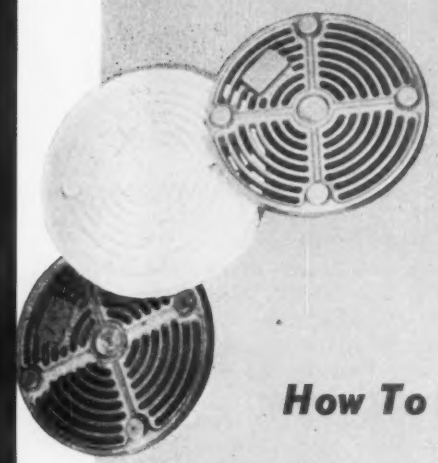
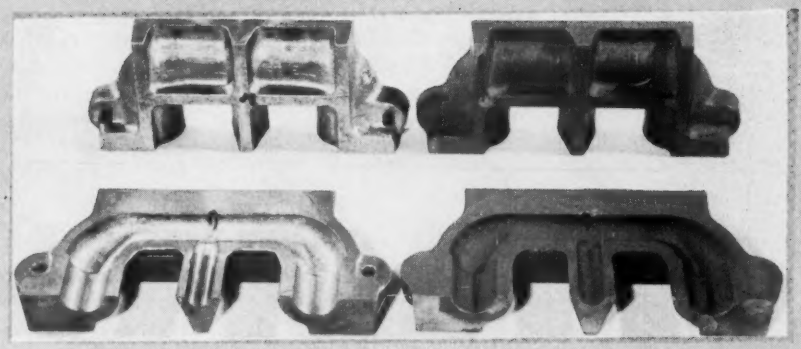


Fig. 5—Idealistic portrayal of formation of interdendritic channels in tin bronzes. Chilled skin should be comparatively free from these channels or voids

Bottom to top—Wood master pattern, laminated epoxy mold, cast epoxy pattern





Cast aluminum corebox at left was used for model. A plastic mold was made from which plastic corebox at right was cast

How To Make...

Epoxy Patterns and Coreboxes

Development of epoxy plastics has given foundrymen a versatile new tool for the duplication of patterns and coreboxes. This article describes how they are used

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FOR the last 15 years, a steady rise in costs and a shortage of skilled manpower have prompted industry to investigate new ideas and materials. Automation has raised production, and improved machines have helped tooling, but efforts to utilize plastics in tooling and production equipment met with limited success until the epoxy plastics were developed.

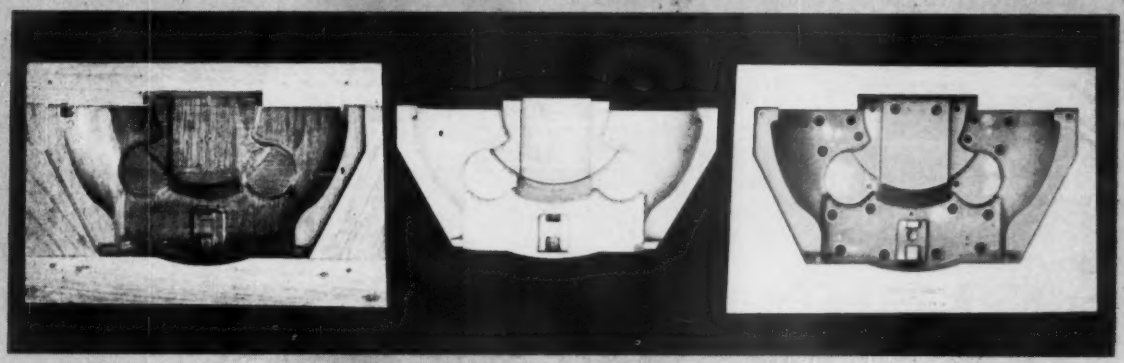
Much use of epoxys as tools has been made in the aircraft and automotive fields, and a substantial amount also has been done in general industrial tooling applications, including foundry equipment such as patterns and coreboxes. Improved materials and techniques are being developed constantly.

Some of the articles about these materials have led the average interested person to believe that they are extremely simple to use. Although this belief is true to a certain extent, this material is new and its limitations and advantages must be understood thoroughly before maximum advantage can be realized from its use. Although this study is not difficult, it is necessary if the materials are to be used successfully. This study is worthwhile.

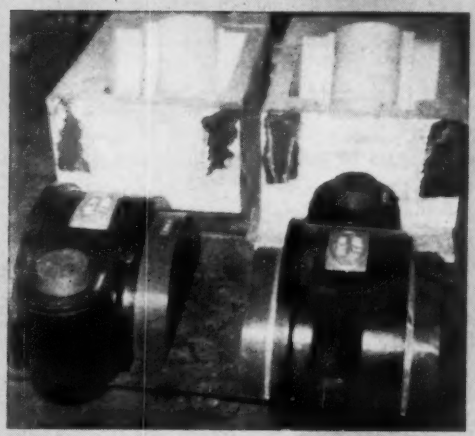
Producers have worked to provide stable materials with consistent properties, coupled with proved techniques and technical assistance to industry. As a result, specifically formulated epoxy materials now are available to simplify the task of producing reliable plastic foundry equipment.

Epoxys are liquid resinous materials which convert to a solid when mixed with a suitable liquid hardener. Conversion is accomplished by use of heat in some instances or by allowing it to stand overnight, usually at room temperature. Most of the materials used in the tooling fields are of the room-temperature curing variety.

Duplicating Process—The epoxy plastic tooling technique is a duplicating process. The mold usually is of plaster or of epoxy material, made from a pattern or model of the part. From this mold, many epoxy patterns or coreboxes can be made in a fraction of time otherwise required to make a duplicate pattern. Practically all cleaning up is eliminated, and the part is ready for use as it is removed from the mold.



Left to right—Master wood pattern, epoxy core made from wood box, and completed epoxy core blowbox made from plastic core



Left—Plaster mold and duplicate patterns. Right—Epoxy core blowboxes cast in one unit and mounted in a cast plastic frame

Surfaces of an epoxy pattern are smooth and free of any voids or pits. They facilitate excellent release from sand without use of lubricants. Epoxy equipment also is completely stable. It does not deteriorate and can be stored indefinitely under average conditions. Repairs or modifications can be made to the equipment at any time since the epoxys adhere to themselves.

Two Methods of Construction—There are two basic methods of construction — laminating and casting. In the laminating technique, the materials are combined with woven glass cloth built up in layers until the desired thickness is obtained. In the casting method, the materials are cast into a mold. It usually is advantageous to try to maintain uniform thickness in the casting. Where this is not possible, it is recommended that a core first be constructed and the materials cast around this core.

Cost of this material generally is considered higher than that of steel or wood on a per-pound basis, but to get a true picture, a comparison should be made on the basis of volume. The average specific gravity is approximately 7.8 for steel, 2.6 for aluminum, from 0.5 to 0.9 for various woods, and from 1 to 2 for epoxys. When we compare these figures, we see that the volumetric ratio, based on a specific gravity, of epoxys to iron, for example, is 7 to 1. Since epoxys are liquids, they can be cast into any shape with very little labor and without scrap losses.

Strength of Epoxy Equipment — Most plastic patterns are of the cast variety, and the approximate physical properties of a typical compound are around 12,000 psi compressive yield strength, 6000 psi tensile, and 9000 psi flexural. Impact strength is 0.41, Rockwell hardness M 70, and the specific gravity about 1.8. A typical laminated construction has a compressive yield strength of about 30,000 psi, tensile 20,000 psi, and flexural 34,000 psi. Rockwell would be about 98.

From these figures, one can see that the laminated equipment is the stronger of the two, but in most instances the additional strength is not necessary. It is particularly important when we realize that considerably more labor is required

Making a Large Cored Pattern

Top row—Left, plaster mold taken from wood model. Center, the plaster mold is lined with felt or hempmat. Right, cover is lined with a plastic parting sheet. Bottom row—Left, pouring the face. Right, a view of completed tool

to produce a laminated tool than a cast tool—a factor which results in higher tool costs. For most applications, the casting technique is satisfactory, and the laminated technique is used only where for some reason—such as the weight of the finished part or the type of piece involved—the casting technique is not feasible.

Advantages of Plastic Equipment—Epoxy plastic foundry equipment has been used with outstanding success on coreblowers and sandslingers. Where multiple patterns, coreboxes, or matchplates are required, savings are substantial. Double shrink patterns are eliminated, and any single shrink pattern can be reproduced exactly without costly finishing.

Once the pattern and mold have been prepared, any number of duplicates can be produced with a minimum of labor, in as little as one hour each, regardless of how complex or intricate the equipment may be. Fast, easy sand release results in increased production and improved castings, and, since the epoxy is unaffected by atmospheric conditions, repairs are relatively unnecessary.

To produce a plastic corebox pattern or matchplate, a mold first must be made from the master pattern or model. The model to be reproduced should be in the best possible condition, and any repairs necessary should be made so that a good mold can be produced. The mold can be made of plaster, or it can be cast or laminated of plastic. Plaster molds should be dried thoroughly and given several coats of sealant.

Since the epoxy materials have tremendous adhesive powers, a release must be applied to the mold to prevent the plastic from adhering to it. Many types of release materials have been used, such as PVA solutions, silicone greases and liquids, waxes, and specially prepared materials. A recommended system is to apply one coat of a proprietary release agent or paste wax and buff. This is followed with a coat of parting compound, sprayed on the mold and followed by an additional coat of the release agent or paste wax. This last coat of wax should be buffed only lightly.

Cast Epoxy Equipment—If the pattern is to be cast, the casting material and its hardener are weighed carefully so that the proper ratio of hardener to the casting material to be used is ready to be blended together. It is important to use the amount of hardener recommended by the compounder for the particular resin employed so that the casting can be cured properly. It is essential that the materials be at a temperature of not less than 75° F to assure a desirable viscosity for pouring.

Making Laminated Equipment

Left to right—1. Surface coat is brushed on. It is viscous enough to stay on a vertical surface without running off. 2. As first stage in laminate buildup, glass cloth is brushed with laminating mix plus hardener. 3. In last stage in laminate buildup, the last piece of glass cloth is brushed with laminating mix plus hardener. 4. View of finished fixture as removed from mold. It could be used as a checking fixture or, with bushings inserted, be used as a drilling fixture

At this point, the hardener or catalyst is added to the resin and blended thoroughly. Thorough blending of the hardener and the resin is necessary to obtain uniform results in the completed casting. If the materials are not blended adequately, soft spots may result in the completed parts. It has been recommended that to obtain good, smooth surfaces, a coat of the casting material be painted on the mold first to insure that no air is trapped on the surface. After the part has been cast, it is left in the mold for approximately four hours or, preferably, overnight.

Cores for Large Patterns—To maintain close dimensional accuracy in large patterns, or if the thickness exceeds 1 in., a two-part mold should be constructed so that a uniform thickness of ½ to ¾ in. is maintained, or a core or filler block should be constructed. This core can be fabricated from a cast plastic material or from steel, plaster, lead, kirksite, etc., and can be made as an integral part of the pattern. Many times, however, the core is removed and used over again as part of the mold in order to make subsequent forms as well as to reduce the weight. The following procedure is used to make the cast plastic core:

The inside of the mold surface is covered with a mat to give a thickness of approximately ½ to ¾ in. over the entire surface of the mold. The mat can be any material such as hemp pad, clay, etc. This mat is covered with a polyethylene or vinyl parting sheet to prevent the plastic core, which will be cast inside, from adhering to it.

The casting material and the hardener are so mixed as to provide a very thin mixture which will permit the addition of bulky fillers such as perlite, vermiculite, gravel, glass marbles or any others, provided that they are of a nonabsorbent type. Perlite, incidentally, is a light, granular material used in wall plaster. It can be obtained from any building supply or plaster supply company.

Fillers should be dried before they are added to the resin mixture since moisture would inhibit the cure. Any amount of the filler can be added to the resin mixture up to the amount that can be handled easily by the operator. This mixture is cast into the mold, which has been prepared with the padding and the vinyl parting cloth, and allowed to cure overnight.

Next, the core is removed, and the mat and the parting sheet are taken out of the mold, which is prepared for casting by application of the release. The core then is suspended in the mold by being hung from cross-ties which span the mold cavity.

The material to be used for casting the face on the core is prepared for use by being mixed with the hardener. Here again, care must be taken that the temperature of the material is at 75° F, to insure thorough mixing and blending and the proper viscosity for pouring.

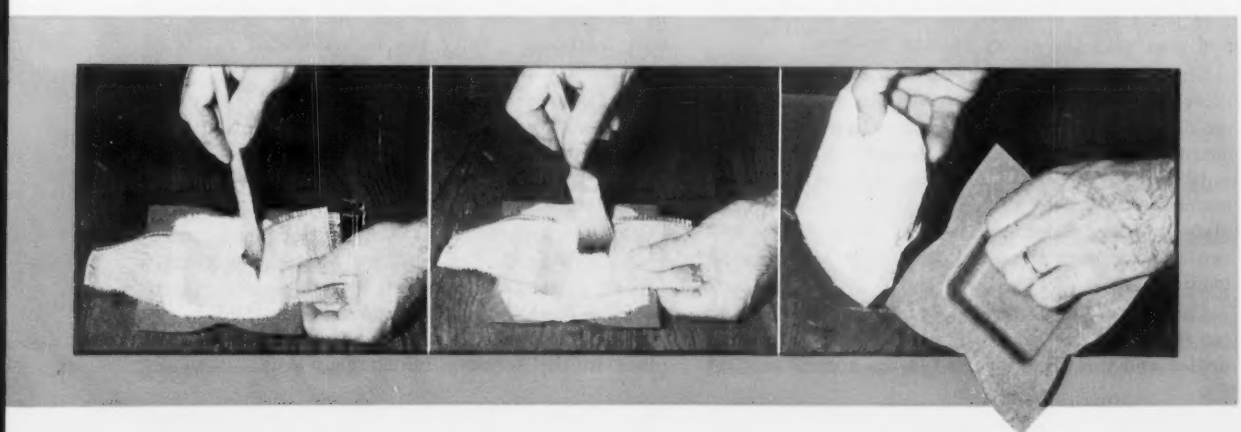
After the material has been blended thoroughly, it is poured into the cavity between the mold face and the core until this area is entirely filled. If any high areas in the mold might result in entrapped air pockets, a sprue or riser should be provided in the core before pouring. Coating the mold surface with the prepared casting material by painting it on before suspending the core in the mold is recommended to insure good surface reproduction. The entire casting is permitted to set for a period of 4 to 24 hours, and it is ready for use on removal from the mold.

Laminated Equipment—If the laminate technique is used, a different procedure should be followed after the mold has been lubricated as described previously. A specially treated, basket-weave type of glass cloth is used because it provides best possible adhesion of the epoxy resin to the cloth and can be impregnated readily with the plastic material. It usually is best to study the particular job to determine how the glass cloth is to be applied and to cut the cloth in the proper pattern so that laminating can proceed rapidly once it has been started.

After the glass cloth has been prepared, a surface coat of the proper material and hardener is prepared and applied to the model with a brush to bring out a good, smooth surface and pick up all details of the mold. The surface coat should be applied to the model with a paint brush until it is approximately 1/32 in. and not more than 1/16 in. thick. This coat is allowed to cure partially until it has become just free of tackiness.

All sharp corners, edges, depressions, or projections that would be difficult for the glass cloth to remain in contact with should be built up or rounded off with putty. This putty is made by mixing glass fibers with the laminating resin until it is the proper consistency.

A layer of the cloth is placed over the entire mold area and pressed into the surface. If the



surface coat has become hard, the surface should be sanded lightly and another coat of the laminating resin mixture prepared and applied before this operation is begun.

After the glass cloth is in place, the laminating material is brushed onto the layer of cloth so that it penetrates thoroughly. All excess material must be removed and all the glass cloth must be in intimate contact with the surface beneath it. A second layer of the glass then is put into place, and the process is repeated until the desired number of layers of glass cloth has been built up. If the edges require trimming, it can be done with a sharp knife before the laminate is completely hard or with a saw after hardening.

Reinforcing ribs or frames can be made from tempered Masonite and cemented to the laminate structure with the putty material used to build up the sharp edges and projections. The laminate then should be allowed to cure overnight.

Matchplate Construction — Matchplates have been constructed by several different methods. One is to make a mold from the pattern. The number of patterns required are cast from this mold and mounted individually on standard plates. These patterns can be attached by pinning or bolting or by cementing with the epoxy resins. Another method is to make a mold of the type used to cast aluminum matchplates and to cast the plastic matchplate. This is the procedure:

The halves of the mold are laid out, open face up, and the plastic material is prepared and cast into each half. At the top of this casting, a heavy rove cloth which has been cut to the shape of the plate is laid into the cast material. More of the casting material then is applied to the top of the rove cloth and worked into it thoroughly. Each half is allowed to set partially so that it will not flow; then the two halves of the mold are closed and stood on an edge. Additional material is poured between the two pieces to fill out the plate section.

Another method is to use an aluminum frame with either V-grooves or tongues on the inside of the frame areas to provide a locking for the cast plastic material. The mold is prepared so that the frame will be clamped between the two halves of the mold. The inside surfaces of the molds are prepared with a release and the surfaces painted as described previously to insure a good surface. The plate then is placed on one-half of the mold and cast with the epoxy casting material.

The other half of the mold also is cast, and after the two castings have set up partially, the mold is closed and clamped together. Any excess is squeezed out, and the mold remains clamped until cured. The plates also can be made by clamping the two halves of the mold with the plate between them and pouring with sprues and vents in the normal casting technique in the closed mold.

Coreboxes for Blowing—Coreboxes for blowing can be made by these same methods. They are drilled and the vents inserted in the normal method by which they are inserted in aluminum coreboxes.

All materials should be kept in covered containers. Before any portion of the material is removed from its container, it should be mixed thoroughly since some of the material may tend to settle on standing. Failure to do this may upset the balance of hardener and result in too fast a cure, shorter pot life, excessive shrinkage, or inadequate cure, with poor physical properties.

Hardener always should be added to the resin and mixed thoroughly. Small batches up to 5 lb can be mixed by hand, and larger quantities should be mixed with a slow-speed power mixer. A paddle made from a steel rod used in a drill press, or a heavy-duty portable drill makes a good mixer.

Pot Life—Pot life depends on the size of batch mixed—the larger the batch, the shorter the pot life. The material used for casting is a much slower hardener than the one used for laminating, and much larger batches can be mixed at one time. If the mixture begins to increase in temperature, the reaction has begun and the mixture should be cast immediately.

It usually is not advisable to pour material scraped from the mixing container into the casting since the correct proportion of hardener ordinarily is not blended with it. The material will not cure, and soft spots will result.

Machining—The casting can be machined, drilled, or tapped. Threaded holes can be cast in by inserting a waxed stud in the desired location during casting.

Repairing Damaged Areas—The tools are easily repaired by thoroughly roughening the area to be repaired, applying the resin and hardener mixture to the area, allowing it to harden overnight or by applying heat to the repair with a heat lamp for two hours, then polishing.

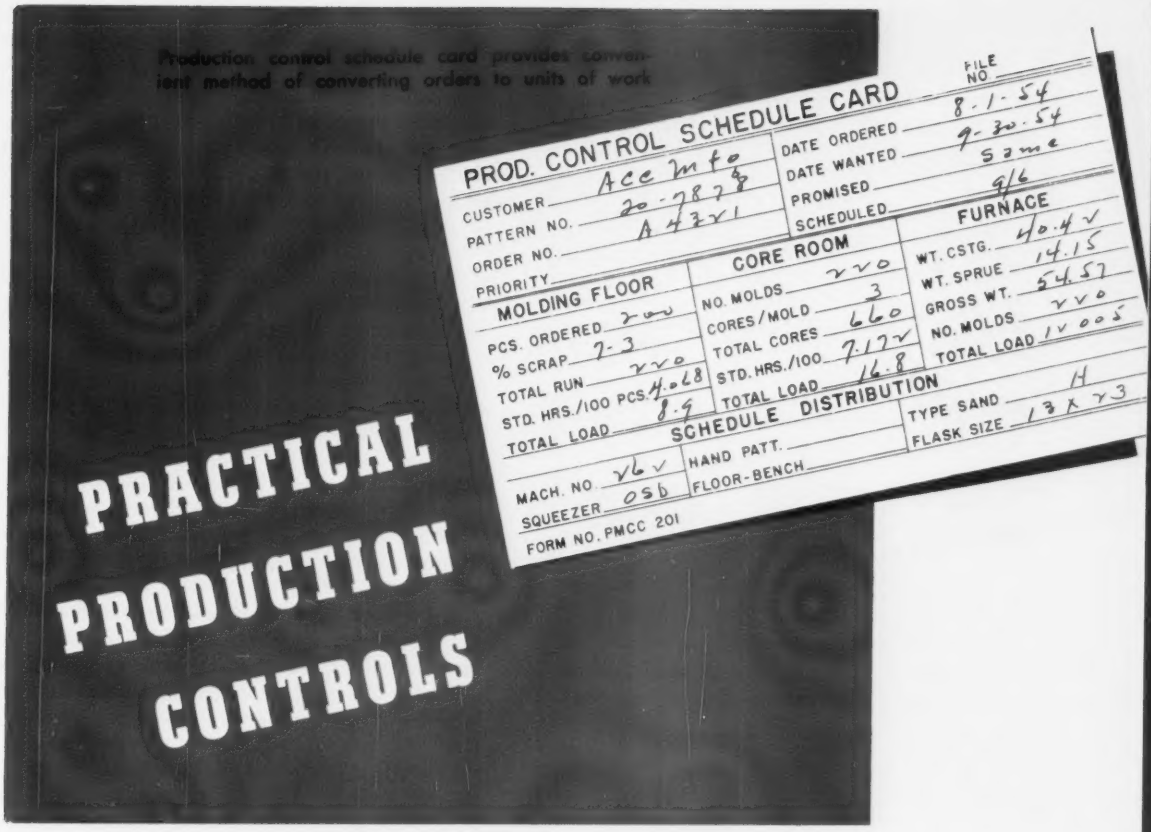
Viscosity—By heating the resin and hardener to 90 to 95° F, the viscosity can be lowered, thereby making it easier to add fillers, cast, and speed up cure. This procedure also provides an escape for air entrapped during mixing and results in a more dense casting with a good, smooth surface.

Cleaning Brushes and Equipment—Equipment can be cleaned by washing it in lacquer thinner or in a proprietary thinner before the resin begins to harden.

The techniques outlined above will produce excellent tools. As the user becomes more proficient in handling these materials, he will develop his own methods. Only the recommended ratios of resin to hardener cannot be changed.

These materials should be used in a well ventilated area, and point of work suction-ventilation is suggested. Protective hand creams or gloves should be used to avoid contact with the resin, which causes a skin reaction in some persons.

Since past experiences with inferior plastic materials have created a cautious attitude, a general feeling exists to wait to see how these new epoxys perform. Although this was understandable in the past, the epoxys now have established a firm place in the foundry industry.



Production control schedule card provides convenient method of converting orders to units of work

Confusion, high cost of goods, and customer dissatisfaction are the penalties of a lack of organized planning of production. Here is a workable control system

By CARL E. ANDRES
Production Controller
Peoria Malleable Castings Co.
Peoria, Ill.

EVERY plant controls production in some manner. A typical procedure is to pass along customer orders to the shop as they come in and expect the shop to get them out as best they can. When the shop gets behind and telephone calls from frantic customers multiply, expediting is put to work to wave telegrams under foremen's noses and state vehemently that unless such-and-such an order is produced at once it will be cancelled.

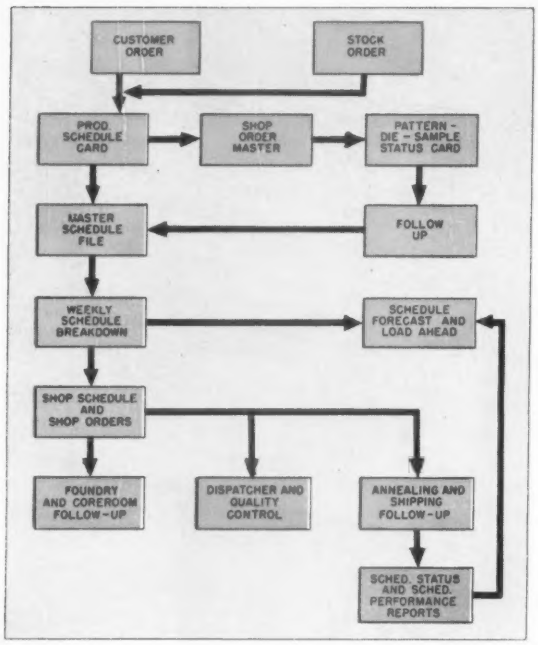
The result is to interrupt production, slow it down with excessive changeovers, and put the shop further behind. Confusion, high cost of goods, and customer dissatisfaction are the penalties of a lack of organized planning in a manufacturing operation.

Production control does not necessarily mean the detailed scheduling, release, and followup of shop orders. These steps merely furnish a system for production. Individual orders should not merit special attention until they become late or "out of control." Production control might be considered a process control—co-ordination of a series of functions according to a plan that will economically utilize plant facilities and regulate an orderly flow of materials through the manufacturing cycle at a predetermined rate.

Development of a master production schedule and issuance of shop schedules according to a plan that will provide a nearly constant rate of production consistent with delivery promises, and a balanced work load or production mix, introduces men, machines, and materials to a preconceived situation. It should produce a planned result. Good organization of controls and thorough training of personnel will assure the plans' working with almost automatic precision, as well as pinpointing plant deficiencies and furnishing management with information necessary for corrective action.

Objective—To provide the service and quality of a job-shop operation while operating on a high-volume production principle. This aim requires attention to the following points:

1—*Customer Service Improvement*—Continuous and scientific matching of customer orders with plant capacities makes it possible to inform customers when delivery can be anticipated, and make those deliveries with a minimum of followup. Building and maintaining firm production schedules will minimize the temptation to yield to pressure from one customer by displacing another customer order without regard to previously made commitments. Discipline in this respect should assure more re-



Flow chart aids economic use of plant facilities and regulates the orderly flow of materials

liable service to all customers of the company.

2—*Cost Reduction through Shop Schedules*—No schedule at all invites poor performance. Well planned schedules afford efficient use of plant facilities, reduce changeover or setup costs, and minimize downtime. The processing of an order as determined by a methods and time study department assures conformance to the formula upon which costs are figured and profits anticipated. Co-ordination with a quality control department assures a lower scrap loss, since corrective action is possible in advance of manufacture.

3—*Accurate Forecasting*—Development of a master production schedule and schedule forecast from orders on hand and/or anticipated, can assist management to plan capacity adjustments and workweek schedules from accurate information, and screen out potential bottlenecks in advance. Accurate forecasting is also the foundation of dependable delivery promises.

Organization—This is the personnel needed:

Production Controller responsible for general planning, supervision of the system, and scheduling. He should have authority to supervise any shop activity relative to his responsibilities and initiate corrective steps to assure conformance to shop schedules. Since he may be liaison between customer and shop, he must have complete co-operation from the shop, the sales department, and top management, if he is to operate effectively. Unless these conditions exist, any production system will break down quickly and might well be abandoned before any more money is wasted on it.

Production Clerk responsible for issuance of work orders, authorizations, and general clerical detail.

Dispatcher responsible for release of work orders and planning individual work assignments. Job assignments should be made in the starting sequence specified by production control, but conditioned by flask availability where there is flask standardization, in order to avoid flask and board changes whenever possible. If there is a quality control section, all jobs should be checked through quality control *before* starting in order to be able to take corrective action to control scrap.

Follow-up is important to prevent dissipation of capacity, neglect of difficult jobs, accumulation of unfinished work in process, and provide a method of accounting for work performed.

Note: If the shop pours less than 50 tons per day or employs less than 30 molders, these functions may be assigned to only two people.

Requirements—Manhours are established data in most industries, they are easy to handle in computation, and have a most important effect on operations. Use of molding manhours as the primary standard of measurement permits loads in other departments to be leveled off to molding manhours capacity.

Since most production control functions depend on accurate time studies made under standard conditions as established by each individual plant, the value of a modern motion and time study group cannot be overlooked in a good production plan. They provide the standards and methods for all work to be performed. Time-study groups can also be used as a fact-finding agency and measuring tool, and are one of the best sources of shop information. The working capacity of all production centers must be known before proper schedules can be established. To prevent overloading, scheduling should be coincidental with departmental performance or efficiency.

To promote accuracy in scheduling, a loading formula for the average production cycle should be developed. This would include actual processing time plus allowances for variables and flexibility in shop planning not included in the time standard.

For example: The actual processing time for a job may be 14 days. A weekly shop schedule may consist of 80 such jobs to be completed between Monday and Friday of the week, a variation of 5 days. Since we are considering our entire schedule as a unit, adding 5 days to the production time would extend the cycle to 19 days. Assuming that the shop will perform as scheduled under these allowances, the entire group of jobs would be available for shipment in 19 days with a minimum of followup. Individual jobs in the schedule would not merit special attention until they became late under this formula. They would then be considered out of control and subject to expediting.

Setting up high and low control limits for departmental performance at specific check points, based on historical data, is a good measurement of the accuracy and effectiveness of scheduling against departmental capacity, of departmental schedule performance and of pinpointing plant deficiencies.

Problems Vary—A few observations might be in order at this point. Problems of production con-

trol vary widely in different plants. For this reason it is not wise to advocate a definite system for all situations. A good method is to build a system or procedure around the plant's operation and personnel which becomes a natural part of the plant.

When converting to a planned control of production operations, it should be done with a firm determination to see it through and allow ample time for honest evaluation. Half-way attempts cause confusion and waste money. It is quite common for some plant executives and personnel to be skeptical of proposed changes because such changes may shift responsibility or disturb prerogatives. It is rare to get all individuals in an organization to co-operate without some disagreement. Some will want to run their own show regardless of any scheme to make the plant function as a unit.

It is advisable to make the general planning and development of a system the joint effort of management and key shop personnel, working with an outside consultant if necessary. By the time a workable plan is developed, most everyone understands it, personnel are developed with it and are ready to get it into operation. From that point on, management should delegate definite authority or responsibilities, and set up disciplinary measures to assure co-operation. The success of any plan depends on how well it is understood by the people who will use it and how intelligently it is used.

Revise If Necessary—It is wise to examine occasionally and revise any portion of the system which has failed to operate satisfactorily. An organized system such as production control which is and should be critical of the entire manufacturing cycle, should also be critical of its own procedures. The system should be flexible enough to accommodate the constant revisions in methods and procedures that are a natural part of a progressive organization, and the injection of "rush" orders of top priority.

But while flexibility is desired, certain disciplines also are indicated. Too many exceptions may "snowball" into complete disruption, reflected in broken promises, increased costs, and poor performance. To guard the reliability of the system it is a good rule to "Plan your work and work your plan."

- SCHEDULE FORECAST AND LOAD AHEAD REPORT -

Planned for 39 floors working 5 days per week

Schedule period	Shop Backlog	Wk 5/20	Wk 5/27	Wk 6/3	Wk 6/10	Wk 6/17
Molding Days Sched.		5	3	5	4	4
" " Loaded		4.9	2.9	4.9	2.8	3.2
Accum. sched. days		5	Memorial Day 8	13	17	21
" load "	14	6.3	9.2	14.1	16.9	20.1
Molding days open		None	None	None	0.1	0.9

- DISTRIBUTION OF LOAD -

PMCC hrs. 2 floors 6 %	0	66	36	60	56	56
		4.6	5.2	5.2	6.0	6.0
Caterpillar hrs. 16 floors 40 %	132	520	322	526	362	362
		44.9	46.7	45.7	39.3	39.3
Other customer hrs. 21 floors 54 %	178	554	312	555	220	322
		50.5	45.2	48.3	23.9	35.0

- MOLDING HOUR DETAIL -

Man hrs. sched. (98%)		1150	690	1150	920	920
" " loaded	310	1140	670	1141	638	740

LEAD TIME ON NEW WORK 6 wks. squeezer 6 wks. OSBORN 2 wks. gray iron

MOLD CAP. SOLD THRU 6/7 CURRENT DELIVERY PROMISES 7/15 or later

ADDITIONAL COMMENTS: _____

Current 95.9 % - PRODUCTION SCHEDULE PERFORMANCE - Average 97.4 %

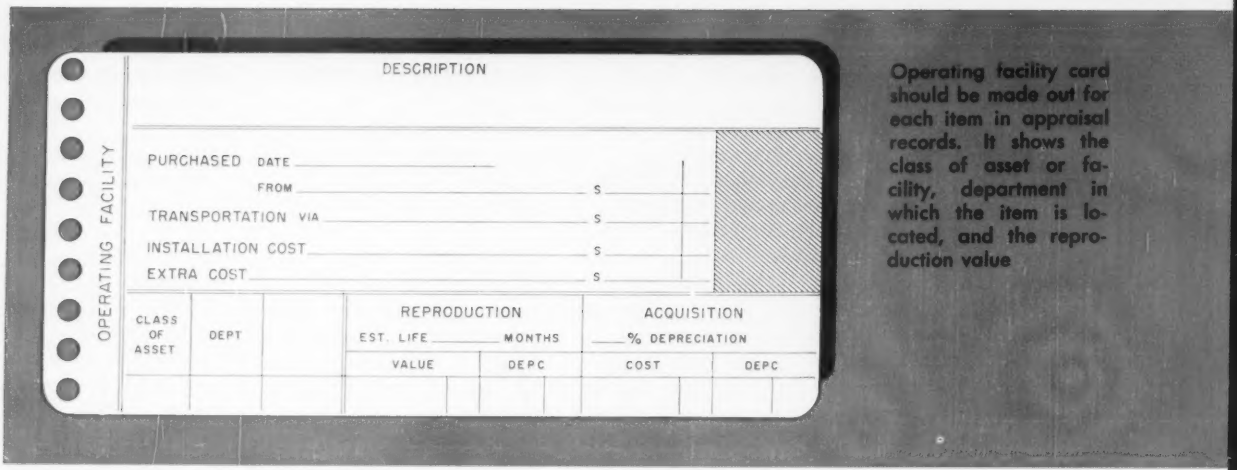
Week starting	4/29	5/6	5/13	April Average	CONTROL
Molding schedule performance	94.3	92.1	88.6	91.9	92.5
Jobs still in ovens	22.4	17.8	13.8	12.0	14.5
Out of ovens not shipped	3.4	1.9	7.2	12.5	6.7
Shipped as scheduled	74.2	70.3	79.0	75.5	78.8
" one week late	20.7	27.7	16.9	21.9	17.9
" two weeks late	5.1	2.0	4.1	2.6	2.9
Total shipments scheduled	116	101	124	109	------

_____ orders 3 wks. late

by Earl Andrew

Date 5/20/57

The schedule forecast and load ahead report is prepared by the production controller. It is issued each week and routed to management, salesmen, and key shop personnel



Operating facility card should be made out for each item in appraisal records. It shows the class of asset or facility, department in which the item is located, and the reproduction value

COST ACCOUNTING PROCEDURES

. . . . . For the Gray Iron Foundry

The second article in Mr. Grover's series covers procedures for handling plant assets. The next installment will deal with such areas as salaries, operating labor, employee expenses, and others

By ALBERT E. GROVER
Cost Consultant
Cleveland

THE first article in this series discussed the value of cost accounting to foundry management. This second installment outlines certain basic cost principles and procedures. Others will be explained in the next installment.

1. **Plant Layout**—In the establishment of an effective cost system, a plant layout designating the various divisions devoted to specific activities of the business should be prepared. It should be fairly representative of the physical operating facilities necessary to produce castings.

Divisions are classified as direct producing and service departments. The direct producing departments are melting, coremaking, molding, barrel cleaning, and hand cleaning. The service departments are pattern shop, pattern storage, metal storage, coke storage, core sand storage, molding sand storage general supply storage, parking, flask storage, and office.

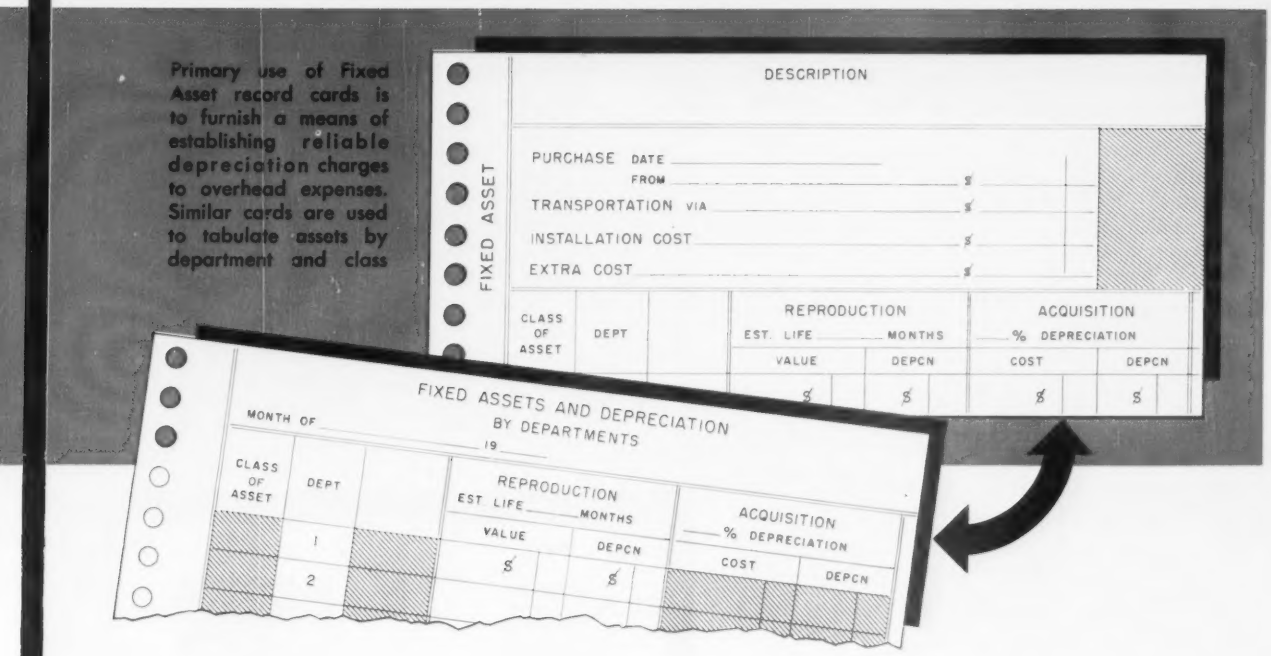
It is important that each item of cost be analyzed and allocated properly to each department and that each service department total be distributed to the direct producing department or departments affected.

2. **Chart of Accounts**—To measure and distribute to departments the various operating expenses and provisions for the use of plant facilities, a chart of accounts must be established. Accounts necessary for a small jobbing gray iron foundry include metals; direct labor; executive salaries; foreman salaries; clerical salaries; indirect labor; employee expenses; repairs; power and light supplies; donations, subscriptions, and dues; and analyses.

A system of numbering makes it easy to report operating statistics, as well as to reduce wrong interpretations of written descriptions—something common in operating a cost system.

The first digit or two digits in these numbers should represent the classes of expenses usually required in a gray iron foundry. The number of accounts may be increased as desired.

The last two digits in the numbers should represent departments that are established for this particular foundry. Among these are melting, core-



making, molding, barrel cleaning, hand cleaning, pattern shop, pattern storage, metal storage, coke storage, core sand storage, molding sand storage, general supply storage, parking, flask storage, and office. Others may be added as desired.

3. **Development and Use of Standards**—It is essential that operating standards be established which will accomplish the following results:

a. Present information that will allow the foundry to enter competition with a full knowledge, based on normal operations, of what it should cost to manufacture and sell each of the various items of product. Sales policies based on a solid foundation of this kind tell management when to accept or refuse business, and why.

b. Establish standards for the various activities of the business against which it is possible to compare actual performances. This step permits management to be informed of irregularities in operation and to reduce losses that might otherwise go undetected.

Standards should be based on a study of conditions as they are. Past experience has little to do with the future because actual tabulations of past performance include past inefficiencies. The way an operation is to be performed tomorrow should be the result of exhaustive research unhindered by past performance. The fact that an operation has been performed a certain way for 50 years is no sign that the same method still is the best.

Manual normals are established from averages of past performance. This procedure is all right if the selected past performance is comparable with present conditions. It is feasible only if the following conditions prevail:

1. Raw materials prices must have been the same as the prevailing ones.

2. Wage rates must have been the same as present ones.

3. Volume of business must have been in the same ratio to the capacity of the plant.

4. Method of production and operating facilities employed must have been comparable to those in current or contemplated use.

Because all of these operating conditions do not obtain in any foundry, a normal operations cost must be determined by the company's capacity to produce and sell with present operating facilities. Past records are used only as a guide to establish fair and reasonable amounts to apply to the potential capacity of the plant.

In all foundries, individual units of production vary to meet the requirements of its customers. The hourly production of the various operating facilities may be different from that of any previous period. This variation may be the result of the introduction of improved facilities, installation of labor incentive systems, or changes in types of product.

The existence of these conditions makes it difficult to establish normal operation on the basis of past performance or potential sales. Therefore some other basis must be used.

Some items of cost remain constant during normal, boom, and depression periods, whereas others vary widely as business volumes fluctuate. There rarely is uniformity in ratios of these different items of cost to weight produced, direct labor, or direct-labor hours. It therefore is essential to the establishment of sound normal cost that each kind of expense be treated separately.

Normal or standard hours should be established as a basis for measuring such items of cost as are related to operating time. For example, there will

be 365 days in 1957, and this figure is used as a foundation for the establishment of normal hours. Since there is irregularity in the days actually worked in the several months of the year, however, certain deductions must be made:

1. Six holidays—New Year's, Decoration Day, Independence Day, Labor Day, Thanksgiving, and Christmas. Each of these holidays comes in a different month of the year, and, necessarily, reduces the actual working days in the month in which it occurs.

2. Fifty-two days are deducted for nonworking Saturdays.

3. Fifty-two days are deducted for Sundays.

4. Proper allowance is made for shutting down the foundry for a vacation.

5. Deduction of any other days on which the foundry customarily closes.

Subtracting these days from the total calendar days in the months in which they occur results in the "normal days."

If the foundry operates on an eight-hour, one-shift basis, the "normal hours" for each month are determined by multiplying the normal days by the eight hours operated each day.

Since it is impossible to operate every facility 100 per cent of the time the facility is available, due allowance also is made for unavoidable downtime. Because downtime varies with the type of facility, further deduction is made to arrive at a fair number of hours on which to calculate the costs of certain fixed expenses.

4. **Operating Facilities**—An important step in setting up adequate cost methods is to determine what operating facilities, in the form of land, buildings, and equipment, are available to produce a normal volume of business. It is the measurement of the reproduction (present-day) values of these facilities that forms the most reliable basis for calculating periodical depreciation, property taxes, and property insurance amounts to be taken up in operating costs.

Some small gray iron foundries have records of plant facilities, established by reputable appraisal companies, which show the reproduction value of each item. Very few of them, however, prepare the detail records in the most advantageous manner for cost accounting use. The following procedure is recommended as a simple and dependable way to prepare records for the calculation of depreciation, property taxes, and property insurance for periodical inclusion in operating costs:

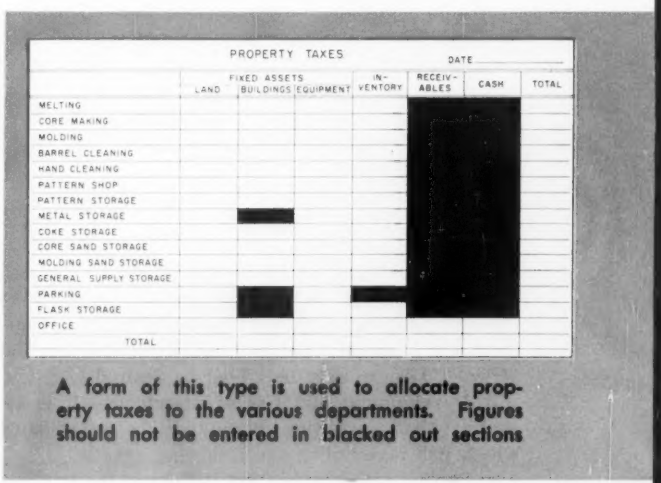
1. Provide "Operating Facility" forms to record each item shown in the appraisal records. These forms usually are 3¼ x 7⅜ in. and ribbon punched for filing in a multiple-ring book or for arranging on a peg board for tabulating.

2. Prepare an "Operating Facility" card for each item recorded in the appraisal book. Show thereon the class of asset or facility, the department in which it is located, and the reproduction value.

3. Estimate the useful life of the facility, from the date it was installed, and enter this figure (expressed in months) on the form. Divide the reproduction value by the number of months of estimated life, and enter the result on the card.

4. Since this card is designed to be used for both cost and tax accounting, the original acquisition cost is entered in the righthand section, with the annual depreciation amount, calculated at the rate acceptable for Federal tax reporting at the close of the fiscal year.

Because certain facilities are appraised (either by professional firms or company employees) by total units that cover more than a single operating division, it becomes necessary to prepare a separate card for each division and a separate card for each cost center within the division. For example, when several departments and cost centers are located in the same building, a procedure is employed to arrive at information necessary to prepare the individual operating facility cards. To do so, allocate a value to each cost center on the basis of its area in relation to the total value and area of the building.



A form of this type is used to allocate property taxes to the various departments. Figures should not be entered in blacked out sections

When all operating facility cards have been prepared, they are filed, by departments, pending tabulations of reproduction values and monthly depreciation charges. Whenever operating facilities no longer are used in production, the facility cards for them are removed from the file. Thus the cards remaining in the file represent the inventory of all operating facilities. Should the market price of any facility be increased or decreased substantially, a new card is prepared, and the old one removed from the file. Whenever a new operating facility is purchased and installed, a new facility card is prepared and filed in the fixed asset file.

5. **Fixed Assets and Depreciation by Department**—The primary use of "Fixed Asset" record cards is to furnish a means of establishing reliable monthly depreciation charges to operating overhead expenses. They also are used to accumulate values on which to calculate provisions for monthly accruals of property taxes and property insurance.

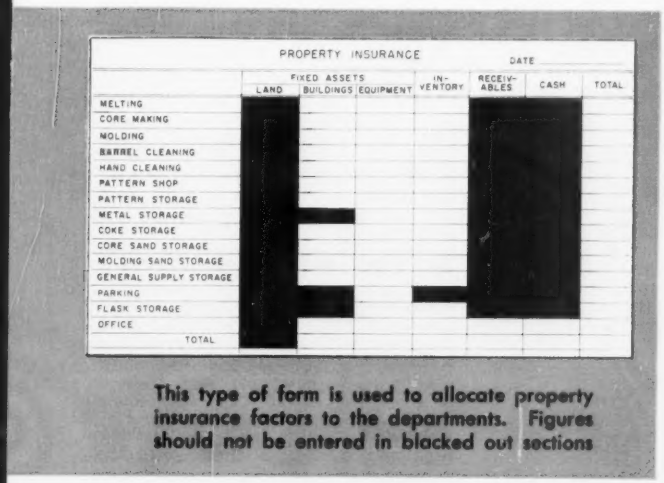
1. The record cards for each department are removed from the fixed assets file.

2. The cards are arranged, one department at

a time, on a peg board for the summation of asset values and monthly depreciation charges, and totals are entered on a report sheet.

To perform this tabulation, the accumulation sheet can be placed on the peg board so that the bottom section of the lowest detail card is directly above the entry line on the accumulation sheet. The other detail cards are spread above to allow for ready addition of the amounts shown thereon. It is good practice to refile each group of detail cards immediately after use for tabulation. The tabulated depreciation amounts are made a part of the monthly overhead expenses schedules, which will be described later.

Tabulated asset values are used as bases for establishment of departmental charges for property taxes and for property insurance. Entries to the "value" column of the accumulation sheet are added, and the total is credited to a depreciation reserve account and charged to the overhead expenses account in the general ledger.


PROPERTY INSURANCE

DATE

	FIXED ASSETS			IN-VENTORY	RECEIV-ABLES	CASH	TOTAL
	LAND	BUILDINGS	EQUIPMENT				
MELTING							
CORE MAKING							
MOLDING							
BARREL CLEANING							
HAND CLEANING							
PATTERN SHOP							
PATTERN STORAGE							
METAL STORAGE							
COKE STORAGE							
CORE SAND STORAGE							
MOLDING SAND STORAGE							
GENERAL SUPPLY STORAGE							
PARKING							
FLASK STORAGE							
OFFICE							
TOTAL							

This type of form is used to allocate property insurance factors to the departments. Figures should not be entered in blacked out sections

6. Tabulation of Operating Facility Cards—In the preparation of operating facility cards, described earlier, an individual card was prepared for each facility in each department. The tabulating procedure for these cards is similar to that employed for the tabulation of fixed asset record cards.

As explained in relation to the fixed asset cards, the tabulated depreciation amounts are made a part of the monthly overhead expenses schedules. The tabulated asset values are used in this instance as bases for establishment of separate operating facility charges for property taxes and property insurance. Totals of tabulations always must be in agreement with entries shown for the various departments in the procedure for determining fixed assets and depreciation by departments.

7. Fixed Assets and Depreciation by classes—The fixed asset cards serve a dual purpose. They provide a means of accumulating data for periodical cost records, as already explained, and for preparation of the annual Federal income tax report. Here we are concerned with the latter.

At the close of the year's operations, the fixed asset cards are removed from the file and sorted to classes of assets as required for preparation of the tax report. The cards are arranged, one class at a time, on the peg board for the summation of annual depreciation amounts. Totals are entered on a report sheet. After tabulation, the detail cards are resorted to departments and returned to the file.

8. **Property Taxes**—Property taxes usually are levied on the several types of assets, often with different rates for land, buildings, and personal property. Also, they are levied on asset values different from those carried on the books of account.

So that each department and the production centers within them can be charged with a practical proportion of the periodic assessed amount, the following procedure is maintained:

a. Land and buildings usually are classed as real estate and take the same tax rate. The tax amount first is divided between land and buildings on the basis of the asset values of each. That portion related to land is allocated to each department on the basis of the area occupied by each. That portion related to buildings is allocated to each department on the basis of building values.

b. Equipment, inventory, receivables (both notes and accounts), and normal cash balances usually are classed as personal property and take the same tax rate. The total tax amount of this class of assets first is divided to these types of assets on the basis of values carried on the books of account: A. Equipment on reproduction values. B. Inventory on values where located. C. Receivables on values of open accounts. D. Cash representing the average balances maintained.

9. **Property Insurance**—Property insurance is a provision for financial recovery for losses caused by fire, theft, vandalism, etc. Premiums paid for this protection are a proper charge to operating costs.

Since insurance premiums usually cover calendar periods different from the periods of accounting, it becomes necessary to proportion the payments paid over the accounting periods covered by the policies. Then allocate each accounting period amount to the operating departments and to cost centers within departments.

1. Fire insurance for the accounting period first is divided between buildings, equipment, inventory, and cash on the basis of coverage designated in the insurance policy, then allocated to departments: A. Buildings on reproduction values. B. Equipment on reproduction values. C. Inventory on values reported destroyed. D. Cash on amounts actually destroyed.

2. Recoveries for losses caused by theft are proper charges to the departments affected.

3. Recoveries for losses caused by vandalism are proper charges to the departments affected.

4. If insurance is carried on notes and accounts receivable, the losses from inability to collect from creditors is included in office expenses.

The next article will cover procedures dealing with other areas.

Questions and Answers

Experience is a requirement in melting copper-base alloys in cupola . . . Change composition to get better structure . . . Fine sand for smooth surface . . . Shell casting has rough surface . . . Sand expansion troubles

Melting Red Brass in Cupola

QUESTION We have a quotation to make on some 85-5-5-5 brass marine stuffing boxes weighing about 500 lb each with gates and risers, and have a minimum metal thickness of 1 in. Our brass furnace capacity is not sufficient to pour that amount of metal, and we would like to know whether we could produce good, clean metal for the castings by melting in our cupola. Castings must be watertight and clean. Would an addition of copper-nickel shot produce a sounder casting? We will appreciate a prompt answer on the feasibility of such an operation.

ANSWER While the cupola is being used successfully in heavy production runs of some of the copper-base alloys using a special type of coke made from coal tar pitch, and from time to time large quantities of metal for big heavy castings have been melted with the conventional foundry coke, the practice requires experience to obtain the desired results. Therefore, unless you are willing to carry on some experimental work to gain the necessary experience, you will be better off by installing additional brass melting units to handle the work, or letting the production go to some other firm.

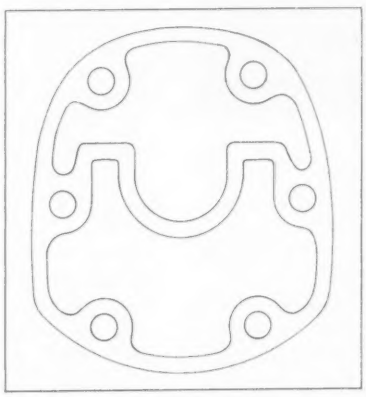
Losses in lead and zinc are relatively high when melting brass in the cupola. Lead loss is about 15 per cent when the content is up to 10 per cent, and higher if that is exceeded. Zinc loss is 50 per cent when the content is up to 3 per cent, and if the content is from 3 to 6 per cent the loss is 60 per cent. Tin loss is reported to be negligible, and there is no loss of copper.

Available information indicates that a cupola lined to 26 in. will melt about 2500 lb per hour. Lining material in the well and melting zone is silicon carbide brick or monolithic material. The bed extends about 36 in. above the tops of the tuyeres. Charges may be 400 to 450 lb, and the metal-to-coke ratio 1:20. Air blast is low, and with a melting rate of 2500 lb and 1:20 ratio, the air supplied will be from 275 to 285 cu ft per minute. Prior to beginning to melt, the bed should be burned through thoroughly.

In connection with the high losses in the more volatile elements, zinc and lead, it might be pointed out that those losses can be reduced considerably through choice of raw materials melted in the cupola. Using only copper as the cupola charge and adding the zinc, lead and tin in the ladle, losses will be minimized.

Encounters Leakage in Casting

QUESTION We are having some difficulty with small gray iron cylinder heads we produce in that we encounter open or porous iron which causes leakage in the two center holes. Composition of the iron shows



Water leaks through bolt holes

3.48 per cent TC, 2.38 per cent Si, and 0.10 per cent S.

ANSWER Fracturing the casting sent to us indicates, as you mention, a somewhat coarse open structure which is more pronounced in heavier sections around the bolt holes. That type of structure is due to the large amount of graphitization which occurs; it can be changed by altering the cooling rate of the casting or the composition of the iron. Since the latter is easier to accomplish we suggest a reduction of silicon content. We believe that the reduction of silicon content to about 2.20 per cent instead of the present 2.38 per cent will provide the necessary refinement of structure by decreasing the amount of graphite precipitation.

Possibly the iron you now are using is designed for production of castings which require the higher silicon content, and the suggested reduction of silicon might cause difficulties. In that case the desired results in the case of the cylinder head castings might be accomplished by ladle additions of a carbide stabilizing agent such as chromium. Try the addition of 2½ oz of crushed ferrochromium per 100 lb iron, and observe the effect on the casting structure after fracturing. Then increase or decrease the addition as the case warrants.

Use Fine Sand for Smoothness

QUESTION Can you suggest a coating which can be applied to the sand mold surface and on cores to provide a smoother surface on aluminum castings?

ANSWER While use of mold coatings and facings is common in the ferrous field and to some extent with copper-base alloys, it is not practiced with aluminum castings. The desired smoothness of surface is obtained by use of fine-grain sands. As might be expected, the finer the sand grain, the smoother the surface, but there are limitations to that rule.

As you know, increasing fineness of sand means decreasing permeability attended by growing tendency to blows. As a consequence, where smoothness of surface is important, the practice is to use the finest sand possible which will not cause blows. It might be pointed out that some foundries are using sands with an AFS fineness range of 210 to 260 and permeabilities from 5 to 15. Such sands must be reconditioned properly and the moisture closely controlled to minimize the tendency toward blows and gas porosity in the castings.

You do not mention the grain fineness of your present sand so we can only suggest that you consult your sand supplier on finer material than you now are using. He will be able to supply you with small batches with which you can experiment to determine the sand best suited to your

requirements on surface smoothness. Where possible, it is advisable to use coarser sands which possess higher permeability.

Rough-Surfaced Shell Casting

QUESTION We have read FOUNDRY for a number of years, and have followed the Question and Answer department with great interest. We will appreciate your advice on a problem we have with extreme roughness on the leg of the enclosed red brass casting. This condition is fairly consistent, and always is at the extremity away from the gate. Core is made from a purchased hot-coated resin-bonded Ottawa sand, 80 AFS grain fineness, 3½ per cent resin, cured for 30 seconds in a core-box heated to 500° F. The 13 x 24-in. shell mold is made on a dump box machine using a 50-50 mixture of 50-mesh Ottawa silica and Juniata sands bonded with 4 per cent resin. Investment is 15 seconds and baking time 1 minute. Alloy is 81 Cu, 2 Sn, 7 Pb, 9 Zn, deozidized with 1 oz phosphor-copper shot per 100 lb. It is melted under slightly oxidizing conditions in a propane-fired crucible furnace using No. 70 crucibles. Metal is poured at 2275° F.

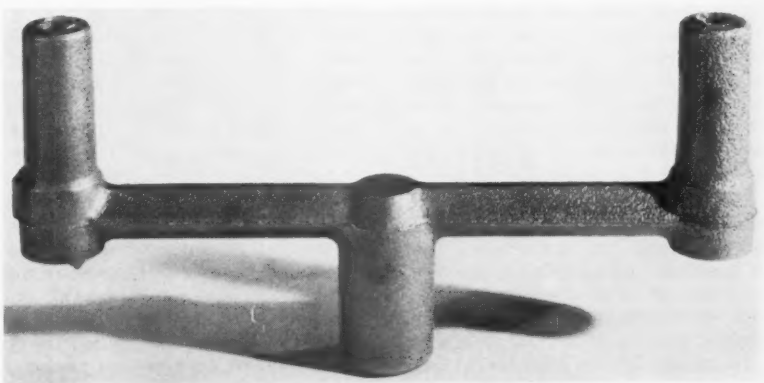
Things we have tried unsuccessfully to eliminate the roughness include pouring at low temperature of 2175° F and up; increasing the resin to 8 per cent; over and under curing the shells; tilting molds uphill; spraying mold face with zircon wash; adding up to 2 per cent woodflour; using 85-5-5-5 alloy; pouring in hot shells; placing legs in cope instead of drag mold; use of oil-bonded core instead of resin-bonded core; use of notched runner to cut down pressure. We tried both reducing and oxidizing furnace flames, and cut the ingate to one-half size.

ANSWER While the casting arrived in good order, the same cannot be said about the shell mold, which was badly broken. However, there were sufficient pieces of large enough areas for examination for possible clues. Although there is a possibility that the temperature might have some effect on the rough surface condition, we believe it is due primarily to the mold. Because complete information is not available on several particulars, it is out of the question to arrive at any definite cause or causes. All that can be done is to indicate the possible factors responsible.

You mention that you are using a 50-50 mixture of Ottawa and Juniata sands, but do not give the grain distribution on either the separate sands or the mixed sand. From a little knowledge of the particulars of the two sands, one can surmise that the grain fineness of the mix is around 70, which appears to be rather coarse if a smooth surface is desired. A mixture of 75 per cent Juniata and 25 per cent Ottawa probably would give a grain fineness of about 80 and a resultant smoother surface, although we would be tempted to try the finer sand alone to see what happens.

While a change in sand grain distribution will provide a smoother casting surface in general and aid to some extent in decreasing the roughness in the bad areas, it will not cure the trouble from other possible causes. One is nonuniform heating of the pattern. On sections which are too hot the resin begins to cure before the sand mix has an opportunity to flow properly against the pattern and leaves small voids. A number of such areas were found in the shell molds.

Such void areas also may be caused by the procedure in dumping the sand mix on the pattern. If the dump action is slow, the slow sliding action of the sand mix across the pattern results in poor filling on the surfaces away from the direction of flow. Dumping action should not be too fast since that promotes entraining air in the mix. A good method to insure straight fall of the sand mix is to incorporate louvres in the dump box which are not opened until the box is almost vertical.



Portion of shell molded casting at right shows extreme roughness of surface

Sand Expansion Makes Trouble

QUESTION We are having difficulties in producing bathtub castings in our foundry in Argentina due to the occurrence of rattails and buckles which show up as lines sometimes with a width of 2 to 3 mm and a depth almost the same. At present we are using a synthetic sand of 65 AFS grain fineness, 8 to 9 psi green strength, 80 permeability, and 3 to 4 per cent moisture. As we have no mulling equipment, addition of a mix of bentonite and dextrine (4:1) is made directly in the shakeout. We also add two shovelfuls of woodflour for each whole flask of 2500 kg of sand.

While we know that this is not the right procedure, we make green sand strength tests every hour, and they vary from 8 to 9 psi. We have to work with a mold hardness of 90 at the bottom of the drag to 65 to 70 at the top. If ramming is softer we have swells. We believe the principal causes of rattails are hard ramming, high hot strength, and high moisture content. Woodflour and dextrine are added to reduce hot strength. With good moisture control then the one possible cause left is hard ramming, but how can we reduce that when mold swelling occurs when the hardness runs less than 90 at the bottom? Which do you think is the best material to use in making patterns? We now are using cast iron using a grinding stone. What kind of a machine do you think we could use to work them?

ANSWER Your description of your problem indicates that it is one of sand expansion, and we are quite sure it can be minimized and perhaps eliminated entirely by use of the proper amount of a cushioning

agent in the sand. Hard ramming, as you mention, is a factor since it packs the sand grains tightly against each other.

When the molten metal comes in contact with the sand, expansion occurs and the sand grains are forced out of position since there is no space between grains for movement. Use of some cushioning agent in the sand, however, such as seacoal, woodflour, cereal, etc., prevents the sand grains from coming in close contact with each other during the ramming operation. In contact with the molten metal, the cushioning agent burns out and leaves space for the sand grains to expand without getting out of position.

While you are proceeding in the right direction to overcome your sand trouble by using dextrine and woodflour, it is fairly evident that you have not gone far enough. You do not give any definite figures as to the amounts of those materials added to the sand so we can only guess as to what they might be. If we assume that in the addition of the 4:1 bentonite-dextrine mix you are incorporating 2 to 3 per cent bentonite by weight in the sand, you are adding 0.5 to 0.75 per cent dextrine. Trying to determine the amount of woodflour is purely a barnyard estimate, however, since there are shovels and shovels, not to mention the question of when is a shovelful a full shovel.

Our guesstimate is that the two shovelfuls of woodflour do not add over 0.10 per cent to the sand. This is based on the assumption that the two shovelfuls are equal to about two gallons (8 liters), and woodflour weighs from 2 to 2½ lb per gallon (240 to 300 grams per liter). Usual additions of woodflour range from 0.5 to 1.0 per cent or from five to ten times the amount you now are adding. The direction in which to proceed therefore is clear.

If possible, the best method would be to mix up special batches of sand containing 0.5 and 1.0 per cent additions of woodflour, and observe the results before making a wholesale change. It should be stressed that the woodflour additions should be added by weight and not by the shovelful if any kind of control is expected, and the same applies to the bentonite-dextrine addition.

As far as patterns for the bathtubs are concerned, we believe that the cast iron ones you now are using probably are best suited for sand-slinger operation. Your reference to finishing with a grinding stone is not quite clear to us, but we suspect you mean that the operation is performed with portable grinders. While that would provide a smooth surface through selection of the proper grade of grinding wheel, it hardly would result in plane or straight surfaces unless the grinder is attached to some type of machine which holds it in proper relation to the work. We believe that finishing large patterns to obtain desired straightness would require properly equipped milling machines or perhaps grinding machines, depending on the amount of metal to be removed.

Cement Floor Use in Foundry

QUESTION We intend to put a concrete floor in our foundry. Because we are making castings up to 5 tons on our center floor, there is some concern about what will happen if a run-out occurs, or if some iron splashes on the floor for any reason. Is it safe practice to pour castings of that weight on a concrete floor? If it is done, could you provide us with a suitable concrete mixture for the purpose?

ANSWER We can see no reason why a concrete floor should not serve satisfactorily in your foundry. It is commonly employed in shops making heavy as well as light castings. The main essential, as in any industrial concrete floor, is that it possess a good wear-resisting surface. Usually that is accomplished by placing a finish coat from ¾ to 1 in. thick on top of the base concrete.

The finish coat may consist of 1 part neat cement to 2 parts 40 to 60 mesh clean silica sand. Instead of silica sand for the finish coat, metallic or abrasive-bearing aggregates may be employed. Base concrete floor should be laid on a heavy cinder foundation 8 to 10 in. thick, well tamped to provide a firm support. Concrete mix should be the standard 1:2:4 from 6 to 8 in. thick, suitably reinforced.

Trouble with spilled metal or runouts should not be much different than in the case of a dirt floor. Dirt floors usually are packed rather hard, from use, and molten metal spilled on them splashes and spatters around. The same thing will happen with concrete floors. Perhaps you feel that metal from runouts will spread farther on concrete floors than on dirt floors; we believe that the chilling action would be about the same.

Of course, if the runout is extensive, there is a possibility of damage to the concrete floor if the mass of iron is allowed to lie on it for long. Hence, if runouts are regular occurrences, it may be advisable as a precautionary measure to place a layer of sand on the floor.

Making Patterns from Plastic

QUESTION We will appreciate receiving any information on the procedures employed in making plastic patterns, and also where the various materials may be obtained. We operate a small wood pattern shop, and believe that there are good possibilities with plastics.

ANSWER Use of plastics or resins for pattern manufacture is increasing, especially where duplicate patterns are required. For some time castable phenolic resins served for pattern manufacture, but more recently epoxy type resins have been receiving the greatest attention. They are reported to have good dimensional stability, high compressive strength, high abrasive resistance, easy release from molding sand, etc. A number of different types are available to meet various requirements as incorporated in patterns.

Specific information on the resins and their application should be obtained from the several manufacturers. Some of the details employed in manufacture of patterns with the resins are presented in "Plastics in Patternmaking" by Paul von Colditz and Harry A. Burton in the December, 1956, issue of FOUNDRY, and in the article starting on Page 86 of this issue.

Briefly, in pattern production a plaster mold or cast is made from the wood master pattern. The mold is carefully dried and the face sealed with a lacquer developed for the purpose. After the sealing agent is dry, it is coated with wax, polished to a high luster, and then coated with a release agent.

If the pattern is small the epoxy resin is poured in and allowed to cure. If the pattern is large the practice is to brush on a thin coating of epoxy resin on the plaster mold face and allow it to become tacky. Then a layer of glass fiber cloth matting is pressed in place followed by another coat of resin and glass cloth, etc., until the desired strength is attained. Remainder of the space is filled with backing resin, and the pattern allowed to cure.

In another procedure the mold or cast is formed of epoxy material instead of making a plaster mold. The wood master is sprayed with a release agent and given a coat of epoxy resin. After that has lost its tackiness, another coat of resin is applied. When that becomes tacky, several layers of resin-impregnated glass cloth are pressed into position. These steps are repeated until the thickness is about 3/16 in. After curing, the epoxy mold is used for producing the pattern.

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Circle 618 on Page 51

Men of Industry

● **WALLY LEVI**
. . . heads Piedmont Chapter

● **ERNEST M. KNAPP**
. . . Gale Mfg. Co. director

● **HAROLD F. FALK**
. . . becomes Falk Corp. pres.

● **PAUL C. HOLLAND**
. . . becomes plant mgr.

THOMAS D. WEST has been appointed manager-shop operations of the steel foundry, General Electric Co., Everett, Mass., where he will be responsible for coremaking, molding, melting, cleaning, and processing. A graduate of Case Institute of Technology, he was for 10 years general foreman at West Steel Casting Co., Cleveland, then foundry superintendent, Symington Gould Co., Rochester, N. Y. Previous connections include Deere & Co., Moline, Ill., and American Radiator Co., Pittsburgh. In 1945, Mr. West became executive vice president of West Steel Casting Co. He was assistant chairman, Division Five, Steel Founders' Society of America.

● **Wally Levi,** first chairman of the new Piedmont Chapter of the AFS, is chief metallurgist, Lynchburg Foundry Co., Radford, Va. Graduated from University of Michigan, he was with Deere & Co., Moline, Ill. for eight years. He joined the Lynchburg company in 1934. Active in AFS, Mr. Levi was its 1950 Charles Edgar Hoyt lecturer and is a member of the executive committee of the Gray Iron Division and vice chairman of the Cupola Advisory Committee. He is also a member of the cupola committee of the Gray Iron Research Institute.

Norman L. Peukert, recently general superintendent, Carondelet Foundry Co., St. Louis, has been named director of sales engineering and development. He joined the company's engineering department in 1938.

● **Ernest M. Knapp,** president, Ferro Machine & Foundry Inc., Cleveland, has been elected a director, Gale Mfg. Co., Albion, Mich. Mr. Knapp became associated with Ferro Machine in 1933, became treasurer in 1946 and president in 1950. During World War II he served on the Industry Advisory Committee, Office of Price Administration, and the National Production Authority, and for several terms was a director of Gray Iron Founders' Society. Mr. Knapp is secretary-treasurer and a director of Foundry Educational Foundation.

● **Harold F. Falk** has been elected president, Falk Corp., Milwaukee, succeeding his father, the late Harold S. Falk. **Matthew A. Carpenter,** since 1953 chairman of the executive committee, continues in that capacity and also has been named chairman of the board. Harold Falk joined the company after graduation from University of Wisconsin in 1933. After serving as general superintendent, works manager, and vice president, he became executive vice president of the company four years ago.

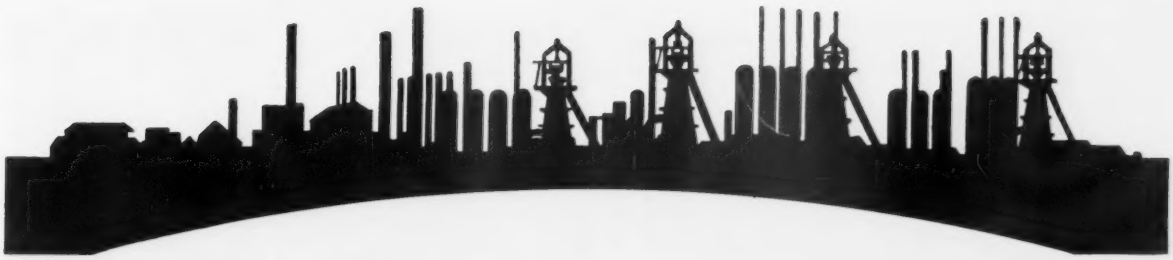
Frederic S. Claghorn has been named vice president in charge of the Foundry Div., Fletcher Works Inc., Philadelphia. He continues as manager of castings sales. **Edward Oliver** has been appointed superintendent of the division. Mr. Oliver previously was with Acme Foundry Corp., Cleveland, Pitz Foundry Inc., Brooklyn, N. Y., and Vulcan Mold & Iron Co., Latrobe, Pa.

● **Paul C. Holland,** formerly product manager, Beryllium Corp., Reading, Pa., was appointed general manager of the new plant recently opened near Paoli, Pa., by its subsidiary, National Precision Casting Corp., formerly of Clifton Hgts., Pa. Mr. Holland will have responsibility for operation of the entire plant.

Edgar D. Flintermann, formerly executive vice president-treasurer, Detroit Gray Iron Foundry Co., Detroit, has been elected vice president, Murmanill Corp., Dallas. He will represent the company's interest in various iron and steel operations and direct operation of an ore reduction plant in Longview, Tex. In 1925 Mr. Flintermann joined Michigan Steel Casting Co., Detroit, became sales manager in 1928 and president-general manager in 1934. After a merger he became president, Misco Corp., Detroit. Mr. Flintermann was president of the Steel Founders' Society of America in 1947-48.

Oliver C. Ralston, since 1949 chief metallurgist, Bureau of Mines, Washington, has retired. He joined the bureau in 1912. In 1953 he was honored by the Department of the Interior in recognition of his contributions to metallurgical research.

William L. Wearly has been elected president, Joy Mfg. Co., Pittsburgh, succeeding **John Lawrence** who resigned to become vice president, Dresser Industries Inc., Dallas. Mr. Wearly joined the company's Franklin, Pa., plant 20 years ago and later



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Circle 619 on Page 51

MEN OF INDUSTRY

● WILLIAM H. BETTS
. . . becomes staff metallurgist

● SAM F. CARTER
. . . AFS Chapter Chairman

● LAFAYETTE E. HAMMOND

● RICHARD W. CRANNELL

Lehigh executive appointments

became vice president-sales. **A. B. Drastrup,** who has been manufacturing vice president and assistant to the president, has succeeded Mr. Wearly as executive vice president.

● **William H. Betts** has been appointed staff metallurgist, United Engineering & Foundry Co., Pittsburgh. A graduate of University of Michigan, he joined United in 1950 as a metallurgist in the research laboratory of the Canton, Ohio, plant. Since 1955 Mr. Betts has been sales-service engineer in the Roll Division.

Herbert H. Bloom, former president, Massey-Harris-Ferguson Inc., Racine, Wis., in the United States, has been elected president, J. I. Case International, S. A., a newly organized wholly-owned subsidiary of the parent company. Mr. Bloom joined the Massey-Harris organization in 1923 and, until 1956, was president. In his new position he will direct overseas operations and also supervise Case's further expansion in Canada. **William Dreier,** formerly vice president-domestic sales, Massey - Harris, and **Alexander Kovacs,** European sales manager, Massey-Harris, also have joined the Case organization, in which they occupy key sales positions.

Alfred W. Escoffier has been appointed manager of the Seattle branch, Thor Power Tool Co., Chicago, with headquarters at its new location there. He succeeds **R. J. Horrocks,** who has been transferred to the company's Denver office. Mr. Escoffier joined Thor's San Francisco branch in 1955.

Irvine H. Gorr, since 1946 field engineer, has been appointed manager of inside sales, INA Dept., Whitehead Metal Products Co., New York. He has been engaged in sales work with the company since 1928.

● **Sam F. Carter,** elected chairman of the Birmingham Chapter of the AFS for 1957-58, is assistant works manager, American Cast Iron Pipe Co., Birmingham. He was graduated from Birmingham Southern College and received his master's degree from University of Wisconsin. With ACIPCO he previously was melter, foreman, plant metallurgist, and melting superintendent. Mr. Carter is a past chairman of Birmingham Chapter of the ASM and has been a member of the Cupola Research Committee and Refractories Committee of AFS.

Mario Olivo, Milan, Italy, well known in foundry circles of Europe and of the United States, was elected an honorary member of Verein Deutscher Eisengiessereifachleute, the German foundry technical society, at its recent convention in Dusseldorf, for his services in the international foundry industry. For many years Mr. Olivo has been associated with the work of the International Committee of Foundry Technical Associations and is chairman of its subcommittee on the dictionary of foundry terms.

Thomas Johnson, since 1952 foundry metallurgist, Fairbanks, Morse & Co., Beloit, Wis., has been named chief metallurgist, Stainless Foundry & Engineering Inc., Milwaukee. Graduated from Michigan College of Mining and Technology, he was for several years metallurgist and later vice president-general manager of Illium Corp., which was acquired by Stainless Foundry in 1953.

Paul D. Frost, chief, Light Metals Div., Battelle Memorial Institute, Columbus, Ohio, has received the 1957 Achievement Award of the Metal Treating Institute. The award was presented for an article and subsequent lecture concerning heat treatment of titanium.

● **Lafayette E. Hammond** has been elected president, Lehigh Inc., Easton, Pa., succeeding **Alvin A. Shumann,** who has become chairman of the finance committee. **Frank E. Shumann** continues as board chairman. Mr. Hammond has been chief engineer since 1948. **Clayton L. Coulter,** with the company 11 years, and a director, becomes vice president-purchasing. **Leroy M. Bissett,** also elected a vice president, continues as general manager, Lehigh Mfg. Co. **Richard W. Crannell** has been named president, **Hans Jacob** and **H. Winton Streeter** vice presidents, and **Fred C. Krauss** treasurer, Lehigh Foundries Co., new name of the foundry division. Mr. Crannell, a vice president of the parent company for 20 years, is vice president of the Malleable Founders' Society. Mr. Jacob has been foundry superintendent since 1942. Mr. Streeter has been manager of the foundry division for six years. Mr. Krauss is also treasurer of Lehigh Inc. and a member of the executive committee.

Warner B. Bishop Jr., vice president, Archer-Daniels-Midland Co., and **Walter G. Andrews,** vice president-manager of the company's resin and plastics division, have been elected directors of Archer-Daniels-Midland (Canada) Ltd., Toronto, Ont., the parent company.

Edward J. Mulroony, formerly sales engineer, Baker-Raulang Co., Cleveland, has been appointed district manager of an area extending from Maine to Virginia. He will establish headquarters at the offices of Otis Elevator Co., New York, the parent company.

Edward G. Wendell, since 1926 district manager of the Dallas branch, Link-Belt Co., Chicago, has retired after 42 years with the company. He joined the company in 1915 as an engineer at the Chicago plant. **Gerald**

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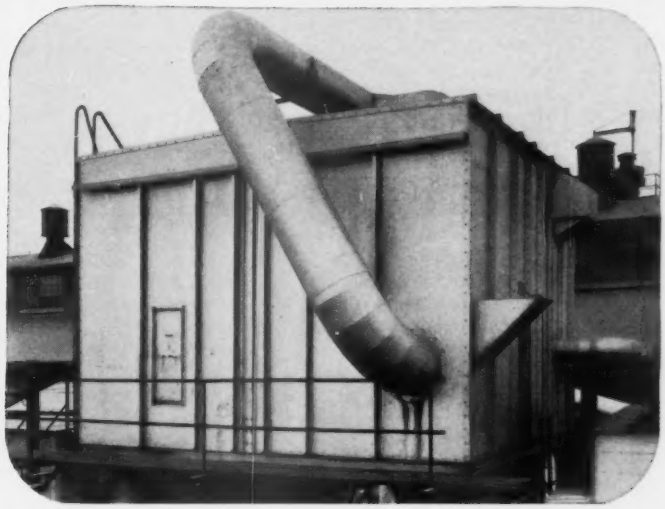

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Twenty-five prominent plants are now ventilating 37 furnaces with Wheelabrator Dustube Collectors that handle a combined total of nearly a million C.F.M. of air. The experience gained in solving the variety of problems posed by these installations is at your disposal. Use this accumulated experience to arrive at the proper solution of your specific furnace control problem.

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MEN OF INDUSTRY

● WILLIAM G. ANDERSON
. . . joins F. B. Stevens

● ROBERT D. DODGE
. . . AFS Chapter Chairman

● RICHARD B. KROPF
. . . automotive activities

● ARNOLD J. MARTIN
. . . Greenfield Co. v. p.

A. Stone, former district manager of the Shreveport, La., office, has succeeded Mr. Wendell. He has been with the company since 1945. **William R. Palmer,** who has been Philadelphia district sales engineer since 1949, has been named district manager in Shreveport.

● **William G. Anderson** has been appointed advertising and sales promotion manager, Frederic B. Stevens Inc., Detroit. He attended Wake Forest College and Detroit Institute of Technology. Until recently Mr. Anderson was sales promotion manager, Fruehauf Trailer Co., Detroit.

● **John W. Phillippe** has joined Acme Resin Corp., Forest Park, Ill., as district manager of the Michigan territory with headquarters in Detroit. He was formerly in charge of the shell molding department, International Harvester Co., Indianapolis.

● **Kenneth W. McGrath,** formerly foundry manager, Hunt-Spiller Mfg. Corp., Boston, has joined the foundry consulting staff, Metallurgical Associates Inc., New York, as a specialist in nodular iron.

● **Robert D. Dodge,** chairman of the Central Michigan Chapter of the AFS for 1957-58, is Michigan sales representative, Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland. He joined ADM in 1949 on graduation from Michigan State University. An active member of the Central Michigan Chapter, he served previously as director, secretary-treasurer and last year as vice chairman.

● **Richard B. Kropf** has been appointed supervisor of development activities in the automotive industry, International Nickel Co., New York, succeeding **E. J. Hergenroether,** retired. After joining the company in 1945, Mr. Kropf was put in charge of the newly opened Cincinnati technical field section. In 1951 he was transferred to the Detroit technical field section office where he will continue to make his headquarters.

● **David T. Morgenthaler** has been appointed president, Foundry Services Inc., Columbus, Ohio, succeeding **Eric Weiss,** who continues as board chairman. Mr. Morgenthaler was graduated from Massachusetts Institute of Technology and until recently was vice president-marketing, Delavan Mfg. Co., Des Moines, Iowa.

● **Arnold J. Martin,** for the last three years sales and advertising manager, Samuel Greenfield Co., Buffalo, was appointed vice president. Prior to joining the company in 1946 he was associated with Linde Co., division of Union Carbide Corp., New York.

John M. Kane, manager of dust control products, American Air Filter Co., Louisville, has been elected president of the board of directors of Occupational Health Institute of Kentucky, formed two years ago to assist industries in developing acceptable occupational health programs.

Frederick E. Lutz, president-general manager, Century Brass Works Inc., Belleville, Ill., has been named a member of the board of directors, Illinois State Chamber of Commerce.

● **John R. Davis** was appointed southeastern representative, Machine Div., Osborn Mfg. Co., Cleveland,

● JOHN W. PHILLIPPE
. . . joins Acme Resin Corp.

● KENNETH W. McGRATH
. . . nodular iron specialist

● DAVID T. MORGENTHALER
. . . Foundry Services pres.

● JOHN R. DAVIS
. . . Osborn machine sales

Crucible Melting

10 SURE GAINS with CRUCIBLE MELTING

Get these 10 for your foundry

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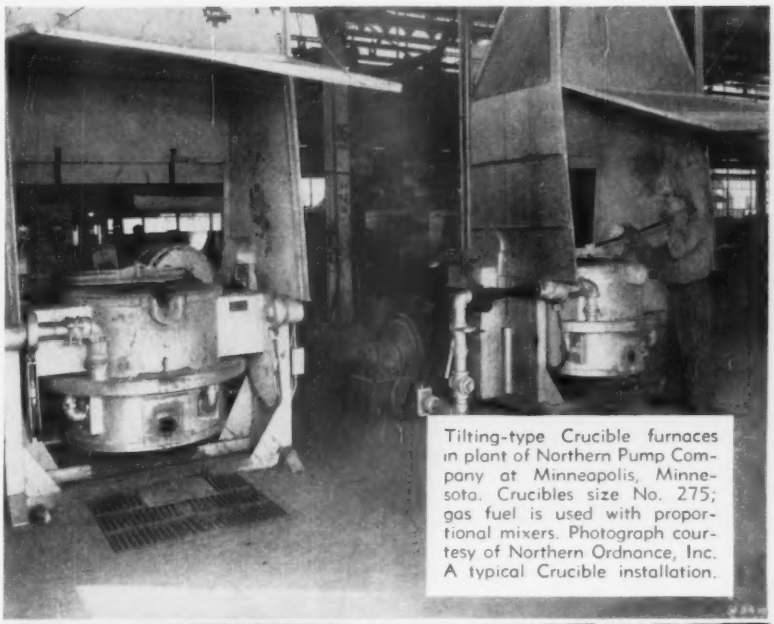
10. AND NOW YOU CAN GET LONGER CRUCIBLE LIFE THAN EVER BEFORE

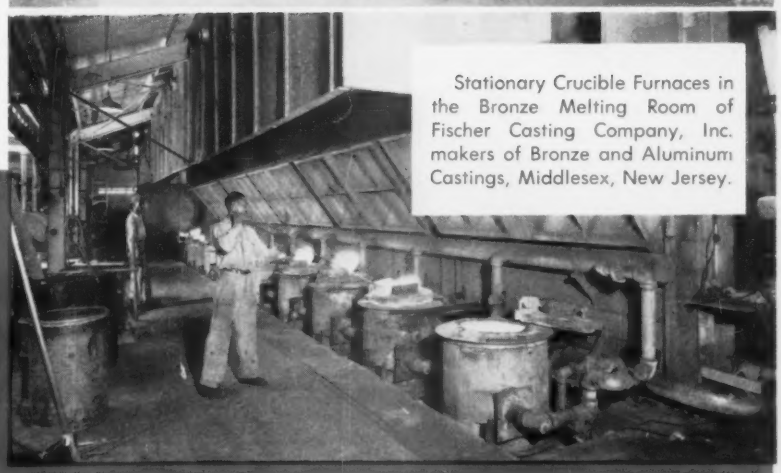
*Each gain proved in actual experience; each enough in itself to make it pay you to use Crucible Melting.

For example, take No. 8—Adaptability. Crucible Melting best meets variations in size and analyses of melts required and expansion or contraction in production.

Have you seen the new "'CRUCIBLE CHARLIE' says . . ." leaflets issued by Crucible Manufacturers Association? If not, ask your superintendent about this. He has a copy.



Tilting-type Crucible furnaces in plant of Northern Pump Company at Minneapolis, Minnesota. Crucibles size No. 275; gas fuel is used with proportional mixers. Photograph courtesy of Northern Ordnance, Inc. A typical Crucible installation.



Stationary Crucible Furnaces in the Bronze Melting Room of Fischer Casting Company, Inc. makers of Bronze and Aluminum Castings, Middlesex, New Jersey.

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AMERICAN REFRACTORIES & CRUCIBLE CORP.

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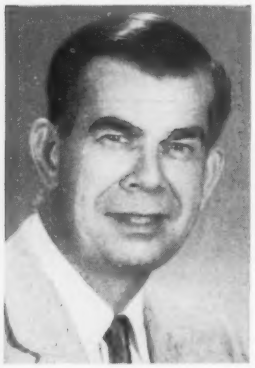
MEN OF INDUSTRY



● **ERWIN H. ALBRECHT**
. . . joins Carpenter Bros.

● **CARL N. FURAY**
. . . joins Howard Foundry

● **DAVID B. SWARR**
. . . Bay State Abrasive sales

● **JOHN PERKINS**
. . . heads Ontario Chapter

with headquarters in Chattanooga, Tenn. He will cover sales in Tennessee, Virginia, Alabama, Florida, Georgia, North and South Carolina, and Mississippi. A graduate of University of Tennessee Mr. Davis was previously associated with B. F. Goodrich Co., Akron, Ohio.

● **Erwin H. Albrecht** has joined Carpenter Bros. Inc., Milwaukee, as sales engineer and foundry consultant. Until recently he was general foundry superintendent, Blackmer Pump Co., Grand Rapids, Mich., and previously was general superintendent, Michigan Light Alloys Corp., there. Mr. Albrecht served as chairman of the Western Michigan Chapter of the AFS in 1956-57.

● **Carl N. Furay** has joined Howard Foundry Co., Chicago, as southeastern head of the company's design engineering field service. Mr. Furay was a chief engineer of a design group, Pratt & Whitney Aircraft Div., United Aircraft Corp., East Hartford, Conn. prior to his new appointment.

Michael A. Wrotniak Jr. has been named foreign sales manager, Electrode Div., Great Lakes Carbon Corp., New York. A graduate of Georgetown University, Mr. Wrotniak joined Great Lakes at the Niagara Falls, N. Y., plant in 1950. He was transferred to New York in 1954 as sales office manager for Electrode Div.

● **David B. Swarr** has joined Bay State Abrasive Products Co., Westboro, Mass., as an abrasive engineer in the Philadelphia area. He has been in military service since graduating from Bucknell University in 1954.

● **John Perkins,** elected chairman of the Ontario Chapter of the AFS for the current year, is general superintendent of production, foundry and heat treat, Ford Motor Co., of Canada Ltd., Windsor, Ont. Mr. Perkins attended Assumption College and has held various supervisory positions in the foundry since he joined Ford in 1935.

Walter A. St. Clair and **James N. Rector** have been named assistant sales managers of the industrial truck division, Hyster Co., Portland, Oreg. Mr. St. Clair, with the company since 1945, has been assistant sales manager of the company's former eastern division. Mr. Rector has been district manager in the southeast district with headquarters in Atlanta. He joined Hyster in 1947.

Ralph E. Betterley has been appointed training supervisor and education director, American Foundrymen's Society, Des Plaines, Ill. Mr. Betterley was assistant professor of industrial engineering, Technological Institute, Northwestern University. Graduated from Stout Institute in 1935 with a bachelor's degree in industrial education, he received his master's degree there in 1947.

Abraham S. Hottel Jr. has been elected assistant treasurer, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. Prior to joining the company a short time ago he was associated with Lybrand, Ross Bros. and Montgomery, Philadelphia, for 29 years.

FIRST AWARD OF MERIT: The first Award of Merit of the Steel Castings Institute of Canada was presented to S. L. Gertsman, chief, Physical Metallurgy Division, Department of Mines and Surveys, Ottawa, at the recent fall meeting of the institute. Mr. Gertsman, right, received the sterling silver medal from G. L. McMillan, Canadian Steel Foundries (1956) Ltd., Montreal, chairman of the group's T&O Committee, who paid tribute to Mr. Gertsman's ability to combine complete practicability with a "vast store of fundamental knowledge." The institute plans to make this award from time to time in recognition of outstanding service to the steel casting industry in Canada

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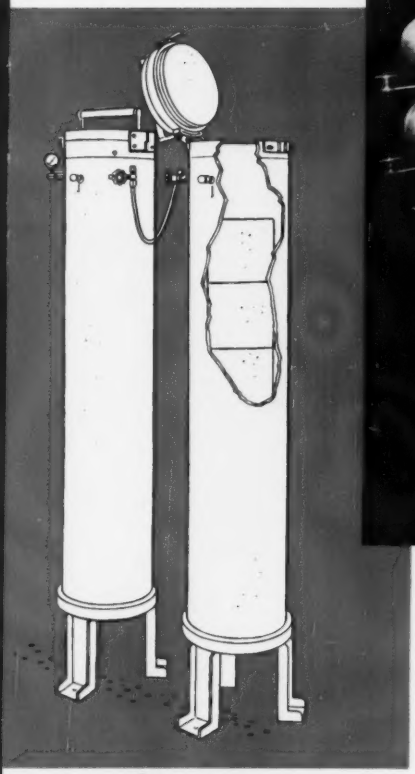

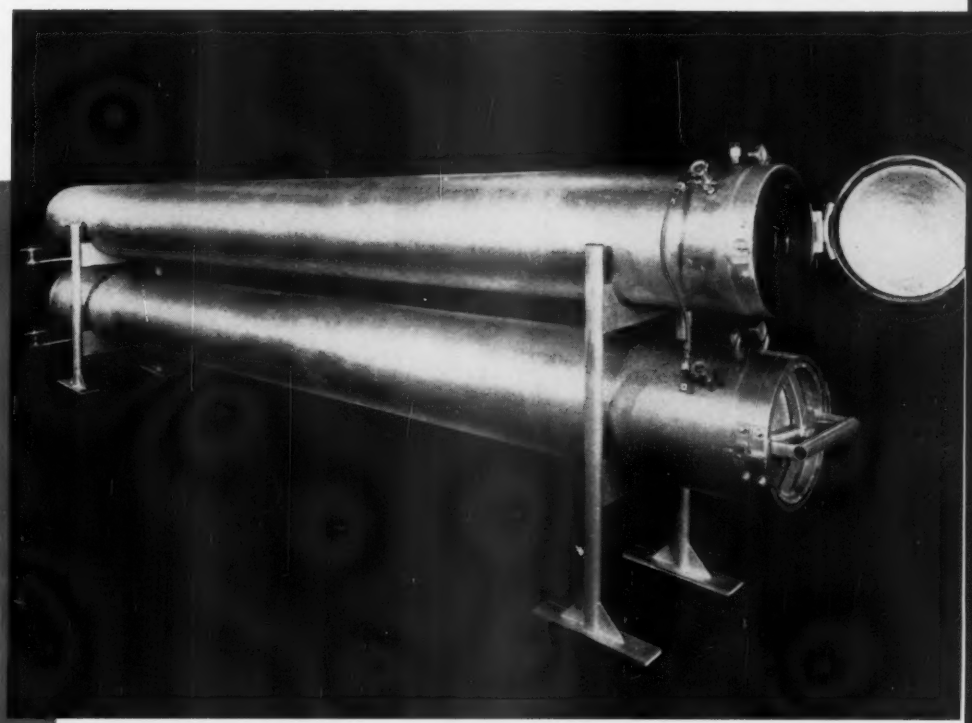

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Circle 622 on Page 51

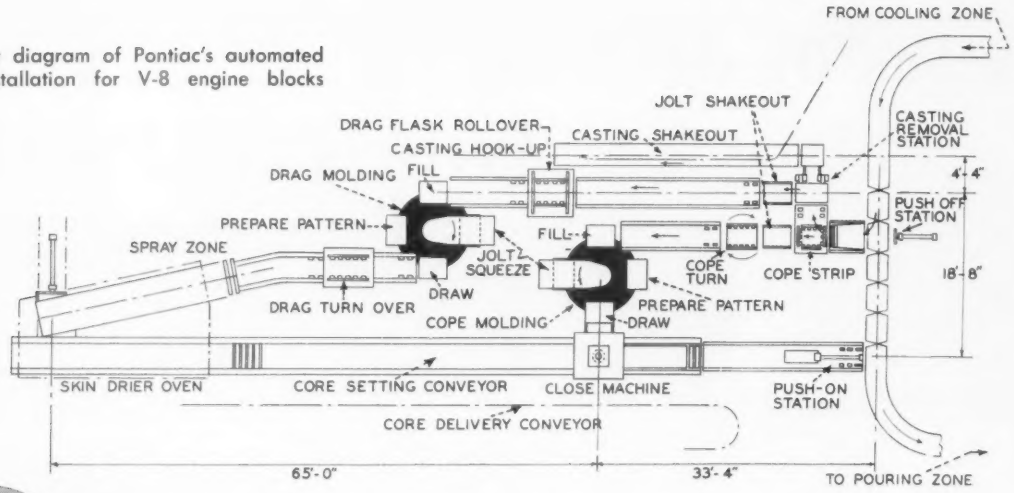


Fig. 1—Flow diagram of Pontiac's automated molding installation for V-8 engine blocks

Pontiac's New Molding Line

Produces 150 Blocks an Hour

By **EDWARD J. TEXLER**
Osborn Mfg. Co.
Cleveland

AFTER two years of mechanized cylinder block production, the foundry staff at Pontiac Motor Div. of General Motors Corp., Pontiac, Mich., has proved that automation in the foundry is more than theory: It works.

When Pontiac engineers thought of the problems of automation in their foundry, they used to shake their heads in doubt. Limit switches and electronic equipment have been known to object to the oil and chip environment of machine shop operation. In the foundry, operations literally throw sand into the works. Then there's the problem of handling and transfer equipment. It's one thing to transfer blocks weighing several hundred pounds, but it appeared much more difficult to transfer flasks which weigh a ton or more when filled with molding sand and metal.

These problems and many more have been overcome by Pontiac's foundry engineers, in co-operation with the Osborn Mfg. Co., Cleveland. Automation in Pontiac's foundry now is producing an average of 150 engine blocks an hour. This line produces 2400 V-8 engine block castings per day, on two 8-hr shifts, and 20 men are doing the work today that required 68 on former block molding operations. The automated production unit is capable of cycling over 200 molds per hour.

Absenteeism, heat, fatigue, and skill have a minimum effect on the molding system because of the limited amount of personnel needed to operate the automatic unit. The unit assumes the duties of molding, closing, and shaking out without any need to handle the flasks manually. Only setting chaplets and cores, pouring, drag spraying, and hanging blocks on the cooling conveyor call for workers other than watchmen to maintain a constant check of the control panel indicator lights and maintenance men to determine and correct causes of minor stoppages.

The unit performs the complete molding cycle from the time sand enters the molding machine to the time the closed mold enters the pouring and cooling zone. After mold cooling, the unit completes the cycle by stripping the cope from the drag, shaking out the sand and the engine block castings, and returning empty flasks to the molding unit.

Various operations in the unit are interlocked by electrical and pneumatic controls designed so that they may be preset for required cycle time and production. The handling equipment is built in multiples of flask lengths. Movement of flasks through the system occurs progressively through a distance representing approximately a flask length. Pusher cylinders are used in conjunction with conveyors to move the heavy flasks. A master control panel, manned at all times, is capable of controlling all phases of the automated system.

The flow of molds and the equip-

Fig. 2—Pre-assembled cores are transferred by core setting fixture which lifts core assembly as a unit

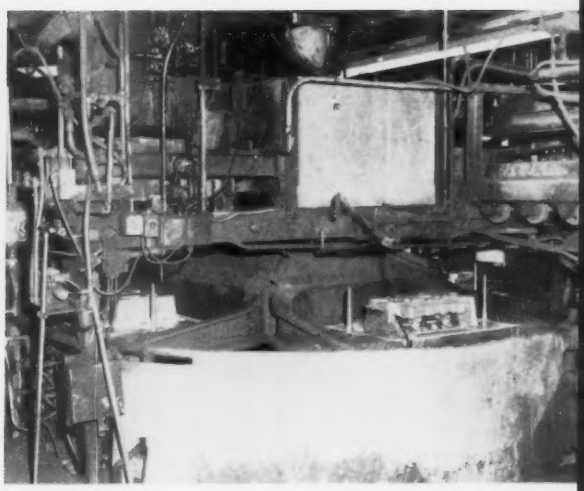


Fig. 3—Molding machines are 4-station indexing units which fill flasks and jolt, squeeze, and draw molds

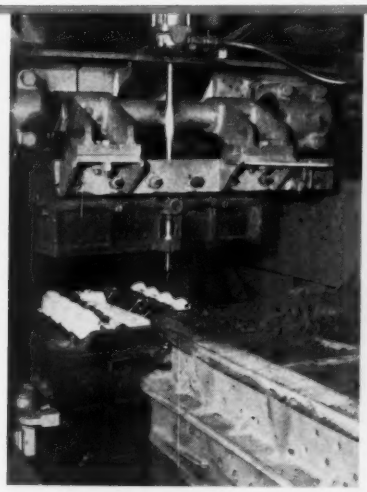


Fig. 4—Closing machine automatically lowers copes over cored drags

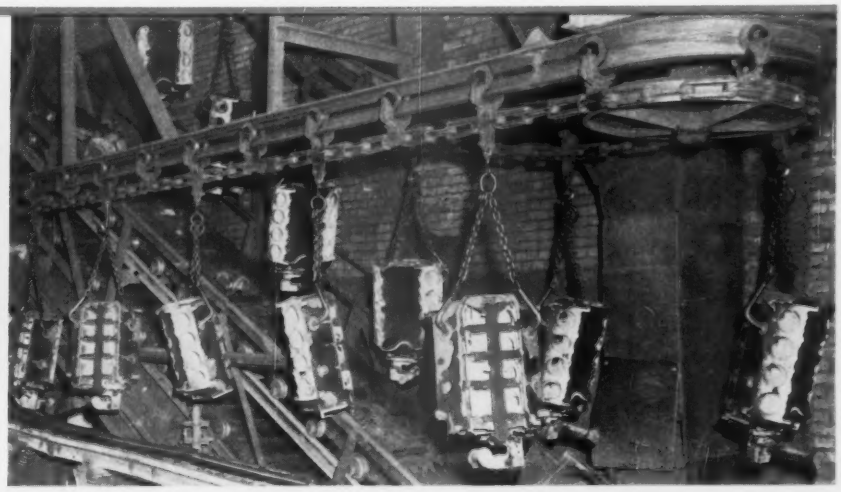


Fig. 5—After pouring, molds are carried to cooling tower by an overhead conveyor. Empty flasks are conveyed back to the molding machines

ment involved in the foundry system is shown in Fig. 1.

Molding is done on two Osborn four-station units, one for making copes and a similar one for making drags. They are identical in principle, but require somewhat different setups and auxiliary equipment because the cope is deeper than the drag and the drag has to be rolled over. Each machine includes an indexing mechanism that carries the patterns and molds from station to station.

The operation begins at the drag molding machine. The metal pattern is blown off by an air jet, then sprayed with a parting lubricant at the make-ready station. While this operation proceeds, the conveyor moves the drag flask into the filling

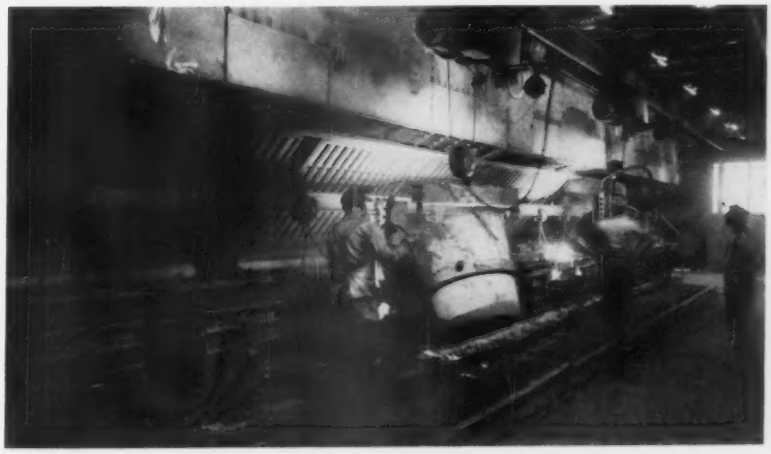
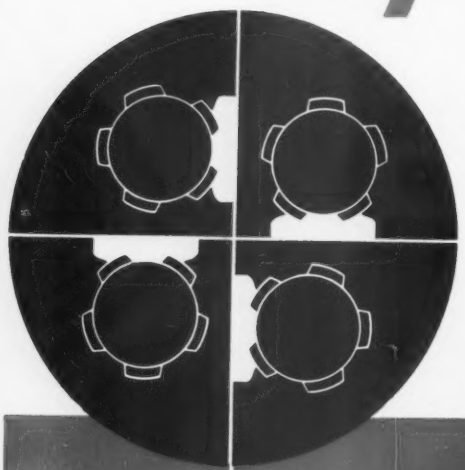


Fig. 6—After the closing operation, molds move through the pouring area on a car conveyor. They are weighted automatically before pouring

...any way you look at it...



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station. When indexing is complete, the pattern is elevated automatically. In moving upward inside the drag flask, the pattern picks up the flask and makes it ready for filling. A slight further upward motion opens the sand hopper gates to fill the flask with a predetermined amount of sand. With the flask still in place, the pattern is lowered to the indexing mechanism, which moves the pattern and flask to the third station. At that point, the jolt-squeeze action occurs.

Molds Are Indexed

Jolting and squeezing take place with the mold and floating pattern plates free of the indexing mechanism. After this operation has been completed, the flask is indexed to the draw station. In the meantime, another flask is being filled and another pattern prepared at the respective stations, as described previously.

At the stripping station, the mold and pattern are raised. The mold is drawn on rollers when the draw piston descends, returning the pattern to the rest position on the indexing cradle arms. The drag mold then is ejected onto a conveyor which moves it to a turnover station. When fully inside the rollover, the drag is turned automatically through 180 degrees, bringing the drag face-up, ready to be moved off onto a conveyor for the next operation, which is to spray the drag mold with a quick-drying graphite solution.

After they have been sprayed, drag molds are pushed onto the coring conveyor. The seven cores which are to be set are preassembled and set into a fixture on a conveyor which carries them to the setting station (Fig. 2). They are removed manually from the conveyor by a core-setting fixture which lifts the cores as a unit and positions them in the drag in a matter of a few seconds. Thus the entire core assembly is set quickly and accurately.

Meanwhile, the cope is being processed on a similar molding machine (Fig. 3). Copes are made in precisely the same way as the drags. At the fourth station, withdrawal of the pattern leaves the cope in an elevated position. The cope is moved into the closing machine automatically and is positioned directly above the drag (Fig. 4). The closing unit lowers the cope onto the drag, closing the mold accurately. The mold then is moved onto a conveyor which carries it to the car conveyor, on which it is poured (Fig. 6).

After pouring, the molds stay on the conveyor for the required cooling time. At the jolt shakeout area,

castings are removed, flasks are emptied, and cope and drag halves are conveyed back to the respective molding machines.

The handling equipment, although not a part of the molding machines, is integrated with them and synchronized so that flasks approach and enter the machines at the proper intervals and so that mold halves are handled out of the machines when they are ready for such transfer. Indexing and transfers are effected pneumatically and hydraulically in response to solenoid valves actuated for the most part by the master timer.

Even the sand supply for this V-8 block line is handled automatically. Sand from the shakeout is checked by probes, and the correct amount of water and bonding material is added automatically in the muller. After mulling, the sand is delivered on conveyors to molding machine hoppers.

A complete preventive maintenance program for this automated foundry unit has been one of the principal reasons for its success. A four-man maintenance crew is available during each of the two shifts the unit operates. This crew consists of a pipefitter, an electrician, a millwright, and a repairman. During the third shift, when the unit is closed down, a crew cleans, checks, and repairs all key operations and machinery units.

Additional economies also are realized by Pontiac in its coremaking department. There, 11 Osborn units turn out the various core requirements. One such machine, for example, is capable of turning out 360 barrel and crankcase cores each hour. These five-station machines blow and draw the coreboxes automatically on a preset time cycle. The cores are baked, assembled, and loaded onto conveyors for delivery to the molding line. Pontiac also has done an outstanding job of core simplification by reducing to seven the number of cores used in the cylinder block castings.

New Film Shows How To Handle Loads Through the Air Safely

Motion picture film, "Take It Away," traces the history of slings and portrays various types in action, while informing the viewer how to handle loads safely and economically with slings. The film is 16 mm, sound, black and white, and has a running time of 20 minutes. It is available for showing on a loan basis by writing to Macwhyte Co., Public Relations Manager, Kenosha, Wis.

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Ingersoll-Rand Overhead Air Hoists are available in many types and sizes. Capacities range from 200 lbs. to 24,000 lbs. Your I-R AIRengineer can point out how these air hoists can give you new hoisting economy. Call him today, or write direct for catalog data.

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Industry Briefs

CONSOLIDATED Foundries & Mfg. Corp., Chicago, has purchased Adirondack Foundries & Steel Inc., Watervliet, N. Y., which now will be called Adirondack Steel Casting Co., a division of Consolidated. H. D. Phillips, formerly executive vice president of Adirondack, has been elected president of the new division, and Fred W. Sherman, formerly president of Adirondack, has been elected vice president of Consolidated and will be active in a consulting capacity for the parent company.

Superior Steel & Malleable Castings Co., Benton Harbor, Mich., has completed an addition to its main office building which includes the following increased facilities: 1. A modern drafting room and engineering department with adjoining stress laboratory. 2. Modern physical and chemical laboratories with additional facilities for gamma ray photography. 3. An enlarged and improved woodworking shop. 4. Additional offices, a conference room, and employee locker and rest rooms.

Archer-Daniels-Midland Co. has dissolved Federal Foundry Supply Co. as a corporation and has formed the Federal Foundry Supply Division of ADM, which also will include ADM's former Foundry Products Division. The new division will include three departments called Archer-Daniels-Midland Co., San-Blo Dept.; Archer-Daniels-Midland Co., Wyolite Dept.; and Archer-Daniels-Midland Co., Wyodak Dept. By the first of the year, administrative offices for the combined division will be at 2191 West 110th St., Cleveland 2, Ohio, at the location of the former Foundry Products Division.

Hoffman Products Corp., Hoffman, Ill., has completed a new building and will manufacture cast iron cookware and other specialty items. The plant is highly modern and is mechanized with eight molding stations and an overhead conveying belt system.

Fletcher Foundry Div., Fletcher Works Inc., Philadelphia, has instituted a $100,000 modernization program to speed up production of gray iron foundry molding. Equipment already installed includes a mobile sandslinger, a sand preparator, and a muller.

Tousey Varnish Co., Chicago, has broken ground for its Quad Cities Division plant in East Moline, Ill. The new plant has been designed so that additional manufacturing space can be added on presently available property. The first unit will cost about $\$1\frac{1}{2}$ million.

Dresser Industries Inc., Dallas, has acquired Gardner-Denver Co., Quincy, Ill., subject to approval by shareholders of both companies. Gardner-Denver will be combined with four present subsidiaries of Dresser to form a new, wholly owned subsidiary of Dresser. It will be known as Gardner-Dresser Co., and G. V. Leece, president of Gardner-Denver, will be chief executive officer. No changes of personnel are contemplated.

Foundry Equipment Ltd. and **L & Y Holdings of Linadale Works,** Leighton Buzzard, Bedfordshire, England, have formed a Canadian subsidiary called F. E. (North America). The new subsidiary will handle sales and servicing of the parent company's equipment and machines through agents in the U. S. and will assist existing agents in Canada.

Sentry Safety Control Corp., Philadelphia, has begun operations in a new, highly mechanized merchant foundry at Pell City, Ala. The plant is capable of producing castings up to 200 lb in iron, aluminum and other metals. Initial production will concentrate on soil pipe fittings.

Rice Sales Co., 256 S. 160th St., Seattle 68, Wash., has been appointed sales representative in Washington and Oregon for Steel City Testing Machines Inc., Detroit. Rice will handle the complete line of Steel City machines for testing physical properties of metals.

Southern Tool Distributing Co., 54 Eleventh St. NE, Atlanta 9, Ga., has opened for business in a modern warehouse stocking metalcutting tools, precision tools, and diemakers' supplies of a dozen manufacturers. The company is headed by R. L. Hill.

A-1 Flushing Pattern Works Inc., 69-10 37th Rd., Woodside 77, N. Y., has been granted a charter of incorporation listing capital stock of 200 shares of no par value. Directors are Robert A. and Madeline Bjerrum, 28

MODERN BRONZE FOUNDRY: A 33,600-sq-ft, highly modern bronze foundry designed to increase production, reduce costs, and improve working conditions is in operation at the new water meter plant of Hersey Mfg. Co., Dedham, Mass. Features include storage space for ½-million lb of bronze ingot, three electric furnaces, a sand handling and conditioning system which operates from 12 ft underground to 50 ft high, and the extensive use of gravity conveyors and transfer devices. The view above shows Charles R. Pate, foundry superintendent, demonstrating a furnace for New England Waterworks Association members

Circle 628 on Page 51→

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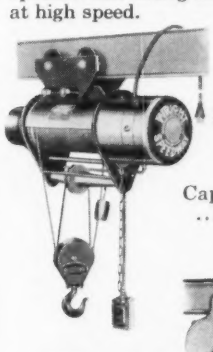
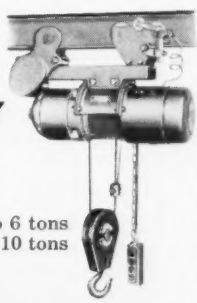


***SPEEDWAY* FRAME 1½**

4-part reeved. Capacity to 2 tons ...relatively slow lifting speeds.



***SPEEDWAY* FRAME 2 FRAME 3**

Capacities—
Frame 2, ½-ton to 6 tons
Frame 3, 4 tons to 10 tons

NEW WRIGHT ELECTRIC CHAIN HOISTS

LIGHT—COMPACT—RUGGED—LOW COST

Two capacity ranges as pictured. Single Chain—300 to 2000 lbs. Double Chain—3000 to 4000 lbs.

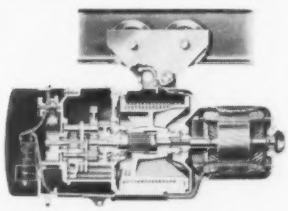
Long Life—Safety—Minimum Maintenance are assured by—

Alloy Steel Load Chain wick-oiled for longest life...heat-treated for long-wearing surface and ductile shock-resistant core—**Load Wheel, Hooks** and **Hook Couplings** drop-forged alloy steel—**Precision Ball Bearings** and **Gears** operate in oil bath—**Double Braking**—**Fewest Moving Parts.**

These Features make WRIGHT *SPEEDWAYS*

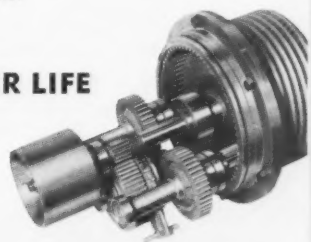
Capacities ¼-ton to 10 tons

your best buy for— MORE PRODUCTION



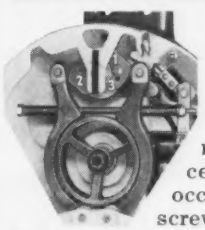
Fine balance and heavy-duty design make possible the continuous handling of tough jobs on any duty cycle for which a 30 minute NEMA motor is satisfactory. All gears and pinions are alloy steel, heat-treated. Their ductile core is shock resistant to severe service stresses. Anti-friction bearings throughout.

LONGER LIFE



Strength of gear teeth of WRIGHT Frame 2 and Frame 3 *Speedway* Hoists has been doubled by a change in contour and grain structure of the metal. Internal gear ring with heavy flange cross section is bolted to drum at six points and provides extreme resistance to distortion.

EASIER MAINTENANCE

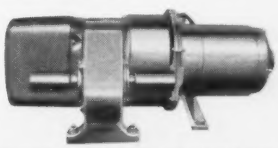


There is "*Nothing to Adjust but the Cam*" to keep the motor brake in perfect adjustment. When excessive load drift occurs...remove the screw shown at Position **1**, swing the cam until Position **2** is in line and replace the screw. Position **3** is provided for the final one-third of brake lining wear. Brake springs and solenoid never need adjustment!

Build Better Cranes Save Money too! with WRIGHT END TRUCKS CRANE DRIVE UNITS *SPEEDWAY* HOISTS

WRIGHT END TRUCKS

For motor-driven cranes and hand traveling cranes—both top-running and under-hung types. Timken Bearings throughout. Wide range of capacities up to 10 tons. Structural steel construction is lighter and stronger than cast frames.



WRIGHT CRANE DRIVE UNIT

For crane and double-beam trolley propulsion. Electric motor transmits power through fluid drive to well-proportioned gear reduction. Units are equipped with WRIGHT-designed solenoid "drag" brake. Size 1 Drive Unit has motors up to 2 HP...Size 2 has motors 3 HP to 7½ HP.

For Complete Information

Write for these Booklets—

DH-73 • New Electric Chain Hoist
DH133B • Frame 1 *Speedways*
E58 • Frame 2 & 3 *Speedways*

Motor Driven Cranes
227 • Underhung, Single Bridge
DH448 & DH449 • Top-Running
DH431A • Crane Drive Units

Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Quotes from Foundrymen...

"Famous Cornell Cupola Flux is the best we've ever used. We always get cleaner iron."

Famous CORNELL CUPOLA FLUX

"Our castings have greater tensile strength since we've started using Famous Cornell Cupola Flux."

"It's simple to use. Just one brick for each ton charge of iron. Yes, we've used Famous Cornell Cupola Flux successfully for years."

The Foundrymen who know melting processes best will always recommend Famous Cornell Cupola Flux because it has proved its worth over the years, day after day.
Famous Cornell Cupola Flux is a scientifically prepared mixture of high-grade fluorspar and other materials which create a chemical reaction in molten iron by greatly increasing slag flow off. Iron is cleaner always when you use this famous fluidizer.

if you melt
Aluminum or Brass
try Famous CORNELL
Aluminum and Brass Flux
Write for Bulletin 46-A

The CLEVELAND FLUX Company
1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

Carol St., Lakeview, N. Y., and Frederick G. Helbing, 185 Rockaway Ave., Rockville Center, N. Y.

Archer-Daniels-Midland Co., Minneapolis, has opened a branch sales office at Suite 308, 300 Mt. Lebanon Blvd., Pittsburgh 34, Pa., to handle the company's chemical products, marine oils, vinyl plasticizers, and industrial cereal products. Charles A. Aldag, formerly technical sales representative at Cincinnati, will manage the new office. Joseph A. Burns & Son, 124 Harrison Ave., Pittsburgh, will continue to act as agent for ADM resins, and E. E. Zimmerman, 1704 Keenan Bldg., Pittsburgh, will continue to handle the firm's linseed and soybean oils.

Harbison-Walker Refractories Co., Pittsburgh, has begun shipments of chemically bonded basic brick from its new plant at Hammond, Ind. The company now has 36 manufacturing plants producing silica, fire clay, and basic refractories in the United States, Canada, Mexico, and Peru.

Bay State Abrasive Products Co., Westboro, Mass., has purchased 15 acres of land in Keith Shaffer Industrial Park, Santa Cruz County, Calif. The company plans to build a manufacturing plant and warehousing facilities there.

Yale Materials Handling Div., Yale & Towne Mfg. Co., Philadelphia, has named a reorganized Col-Mer Co., 949 W. Third Ave., Columbus, Ohio, to be a franchise representative. Personnel of the former Col-Mer Co. and of the Yale subbranch in Columbus make up the new firm.

Gabriel Co. has purchased certain assets of Gladden Products Co. Two Gladden subsidiaries, Lincoln Foundry Corp. and Mustang Motor Products Corp., will become a separate company to be called the Lincoln Mfg. Co.

Merkle-Korff Gear Co. has appointed Zaslow Sales Co., 108 Foxcroft Rd., West Hartford 7, Conn., to be its representative for the New England states, Fairfield County, Conn., excepted.

Precision Metalsmiths Inc., Cleveland investment casting firm, has appointed John C. Richardson Co., Roseville, Mich., to be its eastern Michigan sales representative.

Frank L. Phillips Co., Binghamton, N. Y., has changed its name to Phillips Foundry Inc.

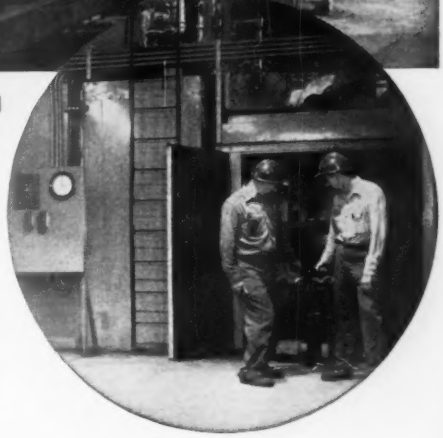
here's another

carl mayer installation...

Cutting Costs for its Owner

CAR TYPE CORE AND MOLD OVEN

Above—A difficult engineering and installation problem solved by Carl Mayer because the oven filled this space completely. This modern oven, with patented down draft heating system and motor operated lift door, replaced an obsolete brick oven.



RACK TYPE CORE OVEN

Right—Installed at rear of mold oven to form an efficient, flexible combination. Miscellaneous cores are uniformly baked with modern, automatic controls. Operation is efficient and economical.

Carl Mayer's outstanding engineering and design features sold the steel mill where these ovens are now in operation. They incorporate the exclusive Carl Mayer recirculating heating system and special triple slotted panel construction.

Heat loss is reduced up to 1/3, and fuel savings up to 50% over old conventional methods are possible. Temperature uniformity is guaranteed.

Consult Carl Mayer now for any type foundry oven or furnace, large or small, and for any purpose. Write for Bulletin 53-CM.

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20800 CENTER RIDGE ROAD CLEVELAND 16, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories

applied experience

by OSBORN

. . . start of an efficient foundry system

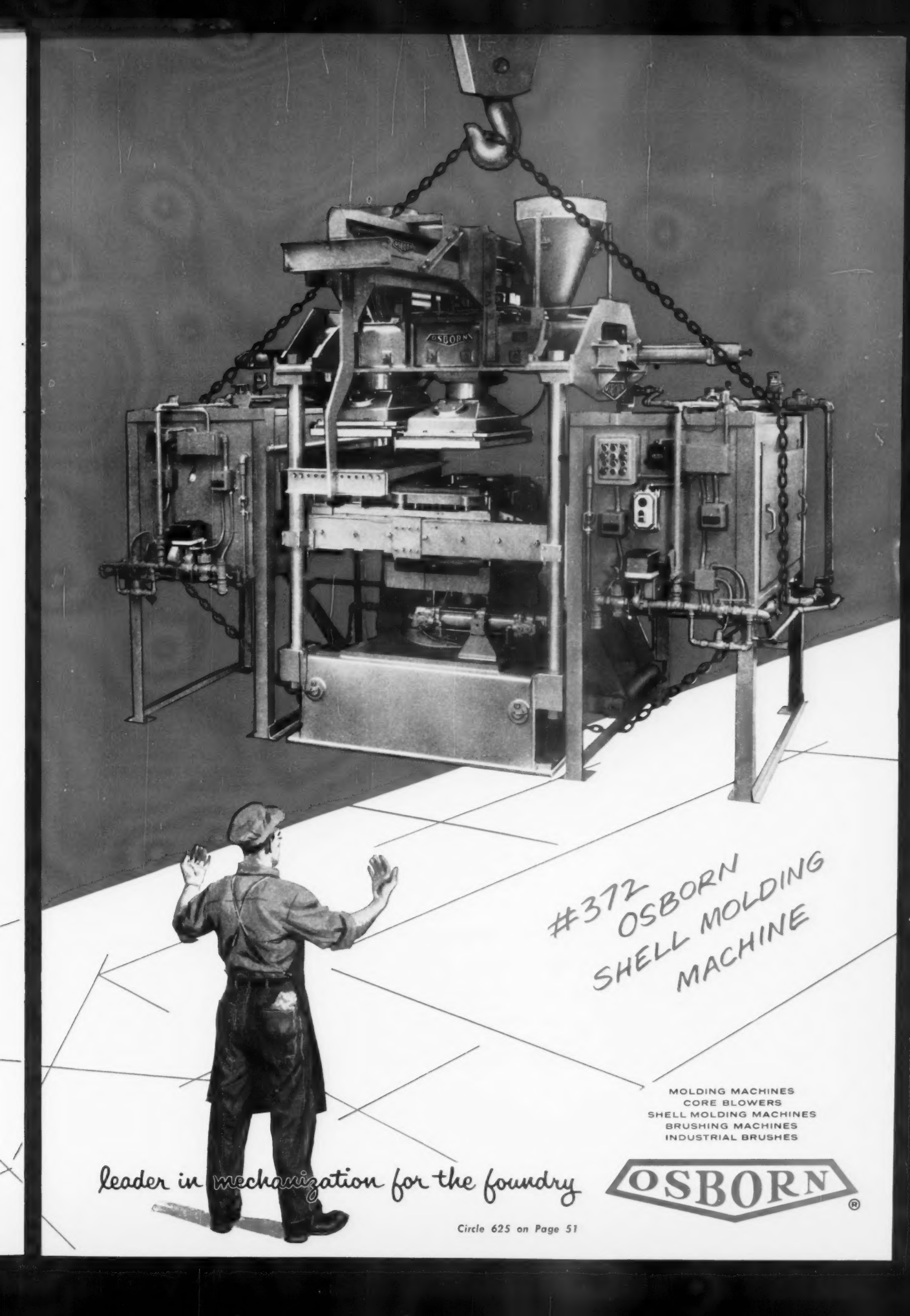
Operating a profit-producing foundry today takes a thorough knowledge of methods and equipment . . . it takes ground-level know-how to cut costs, speed production and still produce *quality* molds and cores. This is the kind of *applied experience* Osborn offers you—starting with an **O**sborn **M**ethods **S**tudy.

The time is *now* . . . when your foundry plans are in the "creative stage". It's the time to get the full benefit of Osborn's *advanced thinking* . . . advanced methods and equipment designed to *boost your foundry's efficiency.*

Call on Osborn . . . where a bonus of over 50 years *applied experience* and technical know-how can work together to help *lower your costs.*

At no obligation, our staff of Foundry Engineers will work with you . . . study your molding and core-making methods . . . help you develop the *best combination* to improve your foundry operations.

Write for full details. *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



MOLDING MACHINES
CORE BLOWERS
SHELL MOLDING MACHINES
BRUSHING MACHINES
INDUSTRIAL BRUSHES

leader in mechanization for the foundry

OSBORN®

Circle 625 on Page 51

GIFS officers, left to right, are C. R. Garland, treasurer; A. M. Nutter, vice president; A. H. Renfrow, secretary, and J. Scott Parrish Jr., president

Merchandising Stressed at

GRAY IRON FOUNDERS' MEETING

Hermann P. Good, right, receives the society's gold medal for outstanding service from Walter L. Seelbach

By FRANK G. STEINEBACH
Editor

THE 29th annual meeting of the Gray Iron Founders' Society, held at the Drake, Chicago, Oct. 9-11, considered in detail the various activities of the organization, stressed the growing importance of the proper merchandising of castings, and discussed the problems connected with sales contracts.

An important feature of the program was the awarding of prizes in the redesign contest sponsored by the society. Prize winners were as follows: First award of $500 to Harold R. Warsmith, Jeffrey Mfg. Co., Columbus, Ohio, for a chain link redesigned from a steel weldment to ductile iron; second prize of $250 to E. S. Frens, General Electric Co., Schenectady, N. Y., for a compressor discharge casing redesigned from weldments to gray iron; third prizes of $50 to Charles Buran, National Can Corp., Santa Clara, Calif., John S. Hanson and Fred J. Zeglen, Detroit Diesel Engine Division, General Motors Corp., Detroit; William D. Rowe, Spartan Aircraft Co., Tulsa, Okla.; R. B. Kennicut Jr., J. I. Case Co., Bettendorf, Iowa; and Jack Bendor, Printing Industries Equipment, New York. Presentation was made by Colin Carmichael, editor, *Machine Design*, who served as chairman of the contest judging committee.

J. Scott Parrish Jr., president, Richmond Foundry & Mfg. Co., Richmond, Va., was re-elected president of the society. A. M. Nutter, treasurer, E. L. LeBaron Foundry Co., Brockton, Mass., was re-elected vice president, and A. H. Renfrow, partner and general manager, Renfrow Foundry, Los Angeles, was re-elected secretary. C. R. Garland, W. O. Larson Foundry Co., Grafton, Ohio, was elected treasurer.

Four new members of the board of directors elected for three-year terms are W. G. Butler, accountant, Golden Foundry Co., Columbus, Ind.; R. Mayo Crawford, vice president, Turner & Seymour Mfg. Co., Torrington, Conn.; J. Douglas James, vice president and general manager, Urick Foundry Co., Erie, Pa.; and R. W. Wilder, secretary, Elkhart Foundry & Machine Co., Elkhart, Ind. D. H. Workman, the society's executive vice president, was reappointed.

Hermann P. Good, division manager, Textile Machine Works, Reading, Pa., received the society's highest award, the gold medal. Mr. Good was honored for outstanding service to the society and the industry. He served as president in 1948-50, was a director for eight years and was a member of the government Industry Advisory Committee during periods of national emergency. As chairman of the Handbook Committee he contributed generously to the prepara-

THE NEW DEMMLER 70

A YEARS-AHEAD DESIGN BLOWS OR SHOOTS ANY TYPE CORES FROM OUNCES TO 10 POUNDS IN WOOD OR METAL BOXES

Latest Sleeve-Type Stationary Magazine: Slot design for most efficient operation; suitable for all core sand mixes.

Shoot Heads: Interchanged in seconds; no wrenches needed.

Quick-Change Blow Plate: Cam-operated clamps; no wrenches needed.

Horizontal Clamps: Quickly adjustable, horizontally and vertically without wrenches.

Fully-Enclosed Draw Mechanism: Six-inch accurate draw stroke.

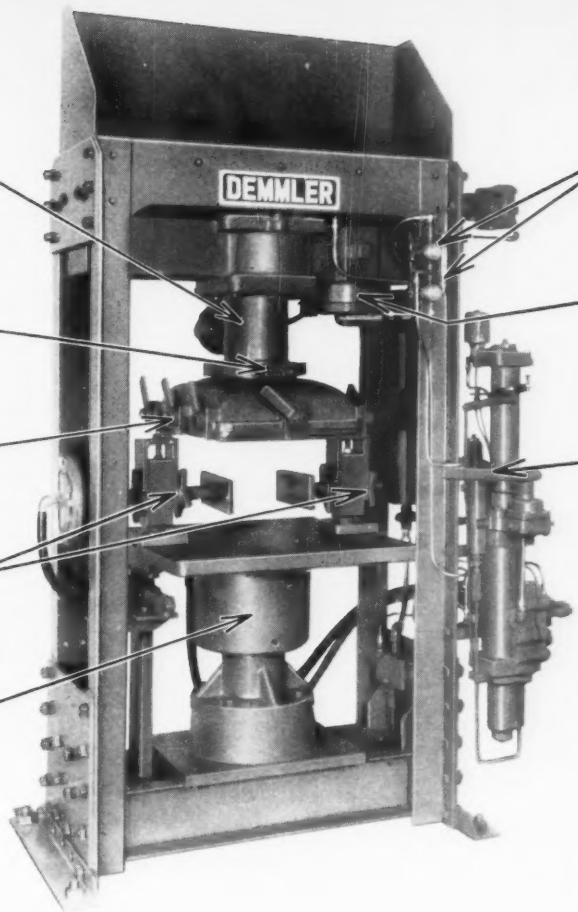


Table Height Adjustment: Push-button operated, eight-inch hydraulic adjustment.

Fast-Acting Large Size Diaphragm-Type Blow Valve: Easily replaceable diaphragms are the only wearing parts.

Automatic Sequence Control: One push of operating lever puts machine through a complete cycle.

Safety Controls: Machine is inoperative unless core box is properly located.

GET MORE FROM YOUR FOUNDRY DOLLAR

The new DEMMLER 70 is a low-cost, high-speed production machine, ruggedly constructed for heavy-duty use. Maximum versatility and ease of maintenance make this DEMMLER core blower a profitable addition for your foundry. Write us for more information. DEMMLER — since 1909 — the first name in core blowers.

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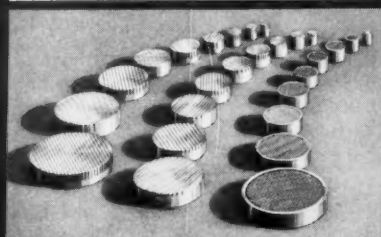


PRECISION CORE BOX VENTS

Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.

Circle 629 on Page 51

HL 150 MESH VENTS

A new general purpose vent which practically eliminates the cleaning coarser screens demand. Write for literature on Demmler vents.

Awarding of prizes in the society's redesign contest. Left to right: Colin Carmichael, editor, *Machine Design*, chairman of the judging committee, President Parrish, E. S. Frens, Charles Buran, H. R. Warsmith

tion of the new *Gray Iron Handbook*.

Other members of the industry also honored and presented with beautiful illuminated scrolls for unselfish and distinguished service are C. H. Meminger, manager, Foundry Division, Posey Iron Works Inc., Lancaster, Pa., and George L. Nimocks, office manager, Dayton Foundry, Hollydale, Calif.

President Parrish reported briefly on major activities of the society, including marketing, the handbook, the work in Washington, and costs. He stated that the board of directors had decided to establish the program evaluation committee on a permanent basis, and paid tribute to the work of C. R. Culling, Carondelet Foundry Co., St. Louis, and his committee members for the previous work done by that committee several years ago. President Parrish indicated that sales training clinics would be established by the society shortly.

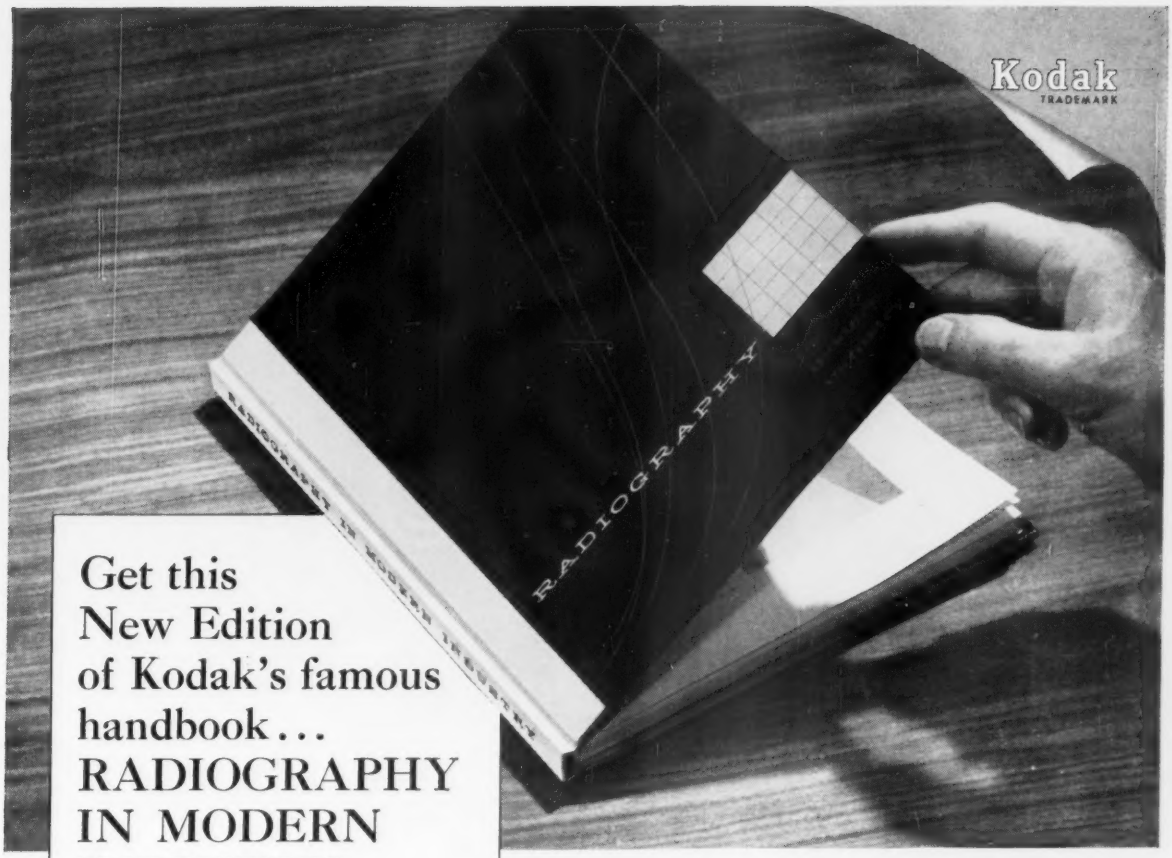
During the president's report, Hermann P. Good, chairman of the Handbook Committee, James S. Vanick, International Nickel Co., committee member, and Charles F. Walton, technical director of the society, carried the first copy of the new *Gray Iron Handbook* on a pillow to the speakers' platform. Mr. Good emphasized the tremendous amount of work necessary to complete that project which has been under way since 1948.

Donald H. Workman, executive vice president, stated that the only basic reason for the existence of the society, or any trade association, is to assist its members to improve their profits. This can be done by cost-cutting ideas and by increasing profitable sales. The society is helping to increase profitable sales by intensive marketing and promotional work, by helping to retain present markets or recover lost markets, by developing new markets, by fostering proper estimating methods and by education on the pitfalls of depending on volume sales alone.

The society is helping to improve profits through decreased costs by the interchange of good ideas, by promoting standard cost accounting systems, by its cost groups, by new employee educational programs and by statistical data. Mr. Workman stated that the society, in its 29th year, had grown to useful maturity on the broad basis of internationally recognized programs and activities which it believes are benefiting not only the industry members but the customers as well.

R. C. Meloy, marketing director, reported that a substantial number of members are applying ideas on marketing provided in society semi-

Officers and directors of the Gray Iron Founders' Society



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Circle 630 on Page 51

Circle 621 on Page 51

nars with considerable success. The fact that these developments are paying off for some emphasizes that others should follow suit.

Mr. Meloy said that government statistics show 1957 gray iron production off only 5 per cent for the first seven months. This would indicate production of 13,000,000 tons in 1957 against 13,861,000 tons in 1956. Production during the last 11 years has ranged from 11 million to 15 million tons, so that 13 million tons would be an average year. Production of ductile iron during 1957 will be approximately 130,000 tons or 1 per cent of the total.

In the first seven months, production of miscellaneous jobbing castings was off 2 per cent, ingot molds off 1 per cent, pressure pipe off 22 per cent, soil pipe off 12 per cent and car wheels off 8 per cent. While the prospects for betterment during the remainder of the year and in 1958 are not too favorable, beyond 1958 the forecasts are brighter.

Marketing Sustains Business

Mr. Meloy emphasized that a sound marketing program can be a great help in protecting against the general slackening in demand and in helping to offset losses due to technological changes in industries using castings.

Charles F. Walton, technical director, in discussing the society's new handbook, said that it has 437 graphs and charts, 58 tables, 9 chapters and a glossary of terms. He emphasized its completeness as a guide for the designer of castings, also that anyone selling castings should be familiar with its contents and should use it.

Mr. Walton also reported on the recent Washington conference on small business, outlining some of the technical features discussed there.

While copies of the annual report of standing committees were distributed to those in attendance, brief comments were made by the chairman of the various committees. J. E. Quest, J. F. Quest Foundry Co., Minneapolis, chairman of the Advertising Committee, indicated that the society would carry out essentially the same program of promotion during the coming year, with special emphasis on the promotion and sale of the new handbook.

John E. McIntyre, Sibley Machine & Foundry Corp., South Bend, Ind., chairman of the Cost Committee, stated that during the year the committee had been concerned with the completion and publication of a book entitled *Costs for the Foundry Executive* by John L. Carter, cost consultant. Two new cost groups have been organized in eastern Canada and Pittsburgh, and the organization of a new group in Charlotte, N. C., is under way. The committee has launched a cost educational program designed to give shop men and sales and office personnel a better understanding of cost methods. A pamphlet entitled "Cost Factors To Be Considered in Purchasing Gray Iron Castings" has been published for distribution to members and customers, and progress has been made on the preparation of a new textbook on cost control.

Henry J. Trenkamp, Ohio Foundry Co., Cleveland, treasurer of the society, stated that the organization is in sound financial condition and presented the budget committee report for the coming year.

W. S. Thomas, Emmaus Foundry & Machine Co., Emmaus, Pa., and chairman of the Marketing Committee, reported on the promotion of the results of the survey presented at the meeting a year ago. He said that these results were also used as the basis for developing a marketing program tailored to the needs of individual foundries, and that this was presented to members in a series of 11 regional marketing seminars throughout the country.

Mr. Thomas also stated that the society exhibited at the second annual Design Engineering Show in New York, that the Marketing Committee participated in the event and talked to many thousands of engineers who visited the booth. The society was also one of the sponsors of the first gray and ductile iron customers' clinic held in Boston in September. He reported that the marketing director had filled a number of speaking engagements during the past year, including American Coke & Chemical Institute, the Foundry Educational Foundation, Penn State Foundry Conference, various society management groups, and AFS chapter meetings.

Tell Designers About Progress

James S. Vanick, chairman, Technical Committee, said that the technical programs for the future must take all of the good features of gray iron castings into account and weave them into a fabric that would be "competition repelling." Progress through castings needs to be explained to the engineer and designer to demonstrate the freedom in lines and flexibility in shape provided by a casting. A metal with the unusual ability to fill a mold easily when liquid and squeeze itself into the nooks, corners, and internal cavities when solidifying, comes to work for him as cast iron. The program in manufacturing a casting itself needs to be explained to the customer. He must acquire confidence and respect for the quality and integrity of castings. He needs to be assured that

FILLED 974 TIMES,

a 1200-pound ladle handled 670 tons of metal before the lining of *IRONTON* BERLITE was replaced. The iron was poured at 2850° F. in a foundry making automotive housings.

Clean Ladles

are a profit factor . . . protecting quality of castings, reducing scrap, saving labor. It pays to use *IRONTON* BERLITE in hand, bull and mixing ladles . . . because BERLITE does not shrink or expand, resists slag and metal erosion, has a higher P.C.E. than any fire clay material. Ask an Ironton foundry engineer how you can put multi-purpose BERLITE to work throughout your foundry. Call or write today.

THE IRONTON FIRE BRICK COMPANY
SINCE 1917
IRONTON, OHIO

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OUR 40th YEAR OF Reliable Refractories

Write for name of nearest representative, or telephone Ironton 109

Circle 632 on Page 51

the ultimate in air cylinder power-

BUILT-IN ELECTRICALLY-CONTROLLED DIRECTIONAL VALVE

BUILT-IN DUAL SPEED CONTROLS

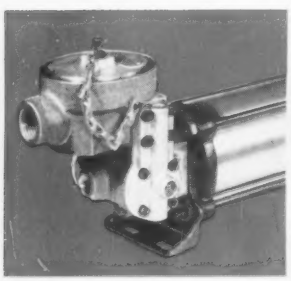
REQUIRES ONLY A SINGLE AIR CONNECTION

THE BELLOWS AIR MOTOR

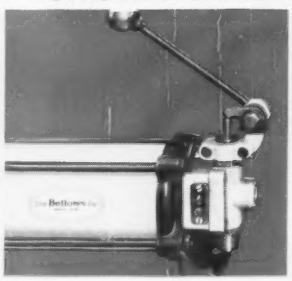
The Bellows Air Motor is a complete air cylinder power unit, with directional valve and speed controls built-in. Takes less than half the space and costs less installed than a conventional air cylinder set-up of equal power with its separate valving and piping. The single air connection, which can be made with flexible hose, makes it ideal for use on moving machine elements. It is a sturdy unit with forged steel heads, heavy brass cylinder, stainless steel piston rod. The piston rod is threaded, equipped with a wrench flat and nut. Many Bellows Air Motors have been operating day in and day out for fifteen years with negligible maintenance. And if service needs do arise, there is a Bellows Field engineer as near as your phone.

The Bellows Air Motor shown above is a 2½" bore unit equipped with the Bellows Low-Voltage (8-12V) Electroaire Valve. Other bores available are 1¼", 1¾", 3⅝" and 4½". Any stroke length. Optional choice of built-in valves as shown below.

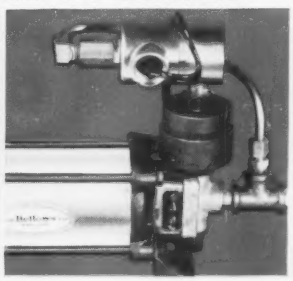
CHOICE OF BUILT-IN VALVES



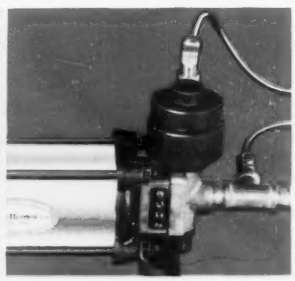
115 V. ELECTROAIRE VALVE
For J.I.C. applications where a 115 v. momentary contact is desirable.



MECHANICAL VALVE
For manual operation or for use with cams or direct linkage.



115 V. MAINTAINED CONTACT
Valve remains in shifted position during period current is applied.



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For use in applications calling for full pneumatic control.

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Fifty pages of data to help you select the right Air Motor-Valve combination for your job. Address Dept. FO-1257, The Bellows Co., Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto 18. Ask for Bulletins BM-25 and SP-55.

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his interests have been properly accommodated.

Mr. Vanick stressed the fact that the Marketing Committee would not have anything new to sell after exhausting the handbook unless the Technical Committee supplies new information on processes, properties, and products. This is the research recycle. Research of the basic or fundamental type is too expensive for any individual or single unit to support. With so much talk about giving priority to scientific research, it is startling to observe that the United States is lagging behind the rest of the foundry world in this

George L. Nimocks, left, and C. H. Meminger were honored for service to the society and the industry

field, Mr. Vanick added. The area of applied research is within the compass of GIFS resources by means of area design clinics. Some planning in that direction is on the program.

At the luncheon meeting, J. Lewis Powell, office of the Assistant Secretary of Defense (Supply and Logistics), Washington, discussed "The Collapse of Time" chiefly as it affects modern weapons. He pointed out that while it took man 250 years to progress from the "short bow" to the "long bow," it took less than 10 years to go from the A bomb to the H device. Under these conditions, military preparedness is inextricably geared to industrial readiness.

One of the interesting sessions took the form of a buzz session on gray iron terms and conditions of sale, with Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, Ohio, and chairman of the committee on Terms and Conditions of Sale, and Hugh Calkins, legal counsel, as moderators. The session evoked many questions and answers concerning sale contracts.

Harold Brown, sales manager, Hunt-Spiller Corp., Boston, introduced an inspirational talk on "Developing Sales Through the Development of Salesmen," by presenting an actual recording on one foundryman's sales call on a purchasing agent of a castings user. While the case was crude, it did illustrate the damaging methods being used by some members of the industry.

Mr. Brown then pointed out that the salesman must know what he has to sell. This does not mean just castings, but what things about these castings will result in both material and emotional advantage to the casting buyer. Proper equipment and other facilities, a good cost system, and the technical organization are some of the plus factors.

A list of potential customers is essential; it may be developed from industrial directories, rumors, present customers, advertising, etc. It then is necessary to get out and call on the prospect and customer. Selling requires movement, and perhaps as much physical effort as actually making castings. Once an order is secured, it is necessary to have adequate liaison between the foundry and the customer. Mr. Brown said that the final and equally important part in carrying out a sound sales program is training a sales organization.

After indicating a potential demand for 26 million tons of castings by 1975, Chester V. Nass, vice president and general manager, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, stressed the fact that cost reduction has been an important factor in keeping foundries in business and that in the future it will become even more important. He pointed out that a cost-reduction program is nothing more than examining every phase of designing, manufacturing, and purchasing materials in large plants or small, and taking organized steps to reduce costs. He said that a farm equipment producer operating several foundries recently reported that for every $1 spent for cost reduction, $18 had been returned to the company in savings in manufacturing costs.

The speaker stated that the industry must be cautious about depending upon obsolete equipment or processes, however new. Equipment installed five or ten years ago, although far from being worn out, may already be obsolete because of changing costs. To solve their cost problems, many foundries are turning to mechanization, and numerous plants have found a solution there for increased production, lower costs, or both. But mechanization does not always provide

In the tap hole area of a malleable iron furnace with metal tapped at 2840° F, *IRONTON* BERLITE mortar is ***more refractory than super-duty brick.*** When the furnace was shut down for repairs after running 16 hour heats, pouring 400 tons a day for weeks, we took the photograph above. The joints of *IRONTON* BERLITE stand out like a backbone along the brick sidewall.

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IRONTON BERLITE will outlast any fire clay material. For an actual photograph and service report on BERLITE in a really hot installation, write to our Special Products Division.

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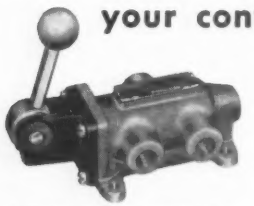
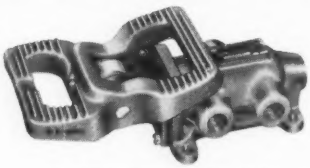
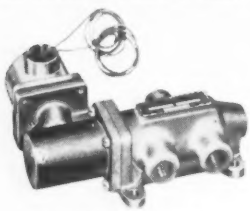


Hand-Operated Four-Way Valve



Foot-Operated Four-Way Valve

Pilot-Operated Valve



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Two- and Three-Way Poppet Type Valves with Roller Lever

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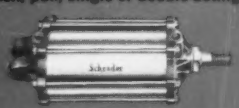
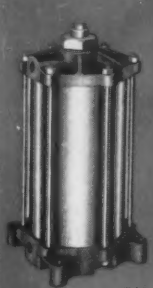
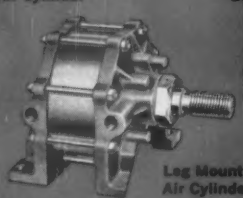


Pivot Bolt Mounted Air Cylinder



Base Mounted Air Cylinder



Leg Mounted Air Cylinder

BLOW GUNS

Button type Blow Gun

Lever type Blow Gun

Drop-Forged Stainless Steel Blow Gun

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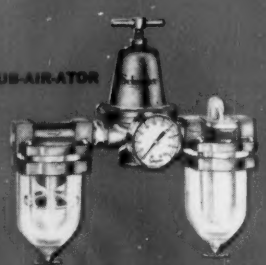
Ferrules and Tools

LUB-AIR-ATOR



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FRANBER CUT-OFF SAW
Rugged construction guaranteed. Uses nylon bonded wheels. 3 HP uses 12" wheel 3" cut. 5 HP uses 14" wheel 4½" cut. Economically priced.

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Circle 636 on Page 51

the correct answer. We must enlarge the concept of mechanization to encompass engineered mechanization, and we should broaden that to include engineered operation. The sum of the two is engineered cost reduction. In conclusion, Mr. Nass presented a film on mechanization.

Roy A. Foulke, vice president, Dun & Bradstreet Inc., New York, discussed the vital part which sound business policies and decisions have on the health of the business enterprise. Six items on the balance sheet which can become too large are as follows: Receivables; inventory; fixed assets; current liabilities; funded liabilities; investments and advances to subsidiary and affiliated companies; and advances to personnel.

Plans Developing for 1958 AFS Congress and Exhibit

Plans for the 1958 Casting Congress and Show to be held May 19-23 in Cleveland have been announced by the American Foundrymen's Society. Housing applications will be mailed out to the entire membership Jan. 15. Advance registration forms are to be mailed to the entire membership Feb. 15. To date, 70 per cent of the entire space is under application and assignment. "Free Day" or "Northeastern Ohio Day" is scheduled for Friday, May 23.

The technical program promises to be of considerable interest to operating foundrymen. Tentative schedule of technical sessions sponsored by the various AFS divisions is shown below:

Monday, May 19
7:30 a.m.—Authors breakfast
9 a.m.—Malleable, Pattern, and Steel
12 noon—Steel luncheon
2:30 p.m.—Sand and Pattern
4 p.m.—Fundamental Papers and Sand
8 p.m.—Malleable Shop Course

Tuesday, May 20
7:30 a.m.—Authors breakfast
9 a.m.—Pattern, Safety—Hygiene—Air Pollution, and Steel
12 noon—Malleable, Pattern, and Board of Directors luncheons
2:30 p.m.—Fundamental Papers, Light Metals, and Sand
4 p.m.—Malleable
7 p.m.—Canadian and Sand dinners

Wednesday, May 21
7:30 a.m.—Authors breakfast
9 a.m.—Annual business meeting & Hoyt Lecture
12 noon—Management luncheon
2:30 p.m.—Education, Light Metals, Gray Iron, and Sand
4 p.m.—Sand Shop Course
7 p.m.—Annual Banquet

Thursday, May 22
7:30 a.m.—Authors breakfast
9 a.m.—Brass and Bronze, Gray Iron, and Heat Transfer
12 noon—Light Metals and Past Presidents luncheons
2:30 a.m.—Brass and Bronze, Industrial Engineering, and Sand
4 p.m.—Light Metals
7 p.m.—Alumni Dinner
8 p.m.—Gray Iron Shop Course

Friday, May 23
7:30 p.m.—Authors breakfast
9 a.m.—Brass and Bronze roundtable breakfast, Gray Iron, Heat Transfer, and Light Metals
12 noon—Gray Iron luncheon
2:30 p.m.—Brass and Bronze, Gray Iron Shop Course, Industrial Engineering, and Sand

Simplify
foundry use
of refractories
and SAVE
with multi-purpose
IRONTON
BERLITE

ONE REFRACTORY does 7 jobs to SIMPLIFY your foundry routine. Add the necessary water to **Ironton BERLITE** and put it to work 7 ways:
RAMMED LINING for bull, mixing ladles.
MUD LINING for hand and bull ladles.
RAMMING MIX for tap & slag holes, spouts.
MORTAR for brick-lined ladles.
MORTAR for cupola block.
PATCHING MATERIAL for all ladles.
WASH COATING for ladles & cupola spouts.

SAVE ON LONGER SERVICE
Slag and metal do not stick to **Ironton BERLITE** . . . so linings are not destroyed in cleaning ladles. **MORE REFRACTORY** than any fire clay brick, **Ironton BERLITE** does not melt or slag out. Since **BERLITE** meets every refractory need, your inventory and delivery worries are over. You'll eliminate refractory repairs, too. **BERLITE** is stored dry; you should never have any waste. Day-to-day service tests prove these facts.

We will send you enough **Ironton BERLITE** to test in your shop under your conditions. We ask only that you pay the freight. If you need help, Ironton engineers are always available to work with your men and show them exactly how to use **BERLITE.** Write or phone us **today.**

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1375 Ashrabula Street
OUR 40th YEAR OF Reliable Refractories
Write for name of nearest representative, or telephone Ironton 109

Circle 637 on Page 51

Patternmaking section is on the third floor of the trade school and occupies an area 40 x 80 ft

Cleveland's New Trade School

Includes Modern Foundry and Pattern Shop

CLEVELAND's newest and most modern school devoted entirely to pre-apprentice, apprentice and adult training in 24 industrial arts was dedicated on Oct. 29 with leaders in labor, industry, and education in attendance.

The new building, named after the late Max S. Hayes, an outstanding labor leader in Cleveland, is an outgrowth of the Cleveland Trade School established in 1917. The imposing structure, three stories high, has a floor area of about 182,000 sq ft. Containing over 70 classrooms and workshops, the building and equipment represent an investment of about $3½ million.

The new school is one of the few trade schools in this country designed and built to fit a program rather than the reverse, and is the result of close co-operation between educators, labor, and industry in careful planning of suitable facilities for adequate training in the various trades. Flexibility is a keynote in design since walls of the various rooms can be moved for expansion or contraction, and the workshops are adaptable to several activities if need arises.

Teaching in the school is divided into pre-apprentice, apprentice and adult training. Pre-apprentice training is for boys under 18 years old who attend classes all day from one to two years. When they reach 18, they become apprenticed to a trade, and then attend school as apprentices. Apprentice training is for those boys apprenticed to a trade, and they attend school for one-half day or 4 hours per week until their apprenticeship is finished. Adult training is conducted in evening classes for those desiring to improve or advance themselves in their particular trades. Present enrollment in the school is 300 pre-apprentice students, 2800 apprentices and 50 adult groups.

Of particular interest to the foundry industry are the sections devoted to training in foundry and pattern-making. These shops are spacious, excellently lighted for both day and night operation, and are equipped with modern tools and facilities, as may be observed in the accompanying illustrations. In addition, adequate classrooms for instruction and discussion adjoin the shops.

The foundry section, located partially below the ground level, occupies an area of 40 x 80 ft. The lower level includes a coreroom about 15 x 19 ft equipped with benches, core-

Foundry section of the new school is partially below ground level and includes a 40 x 80-ft area. Like the pattern shop, it is well equipped

Circle 638 on Page 51→

Season's Greetings

from

INTERNATIONAL MOLDING MACHINE CO.

IN THE FIELD . . .

THE EAST Red Doelman
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THE WEST Johnnie Russo

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AT THE PLANT . . .

Larry Pidmore Jr. Ted Eichler
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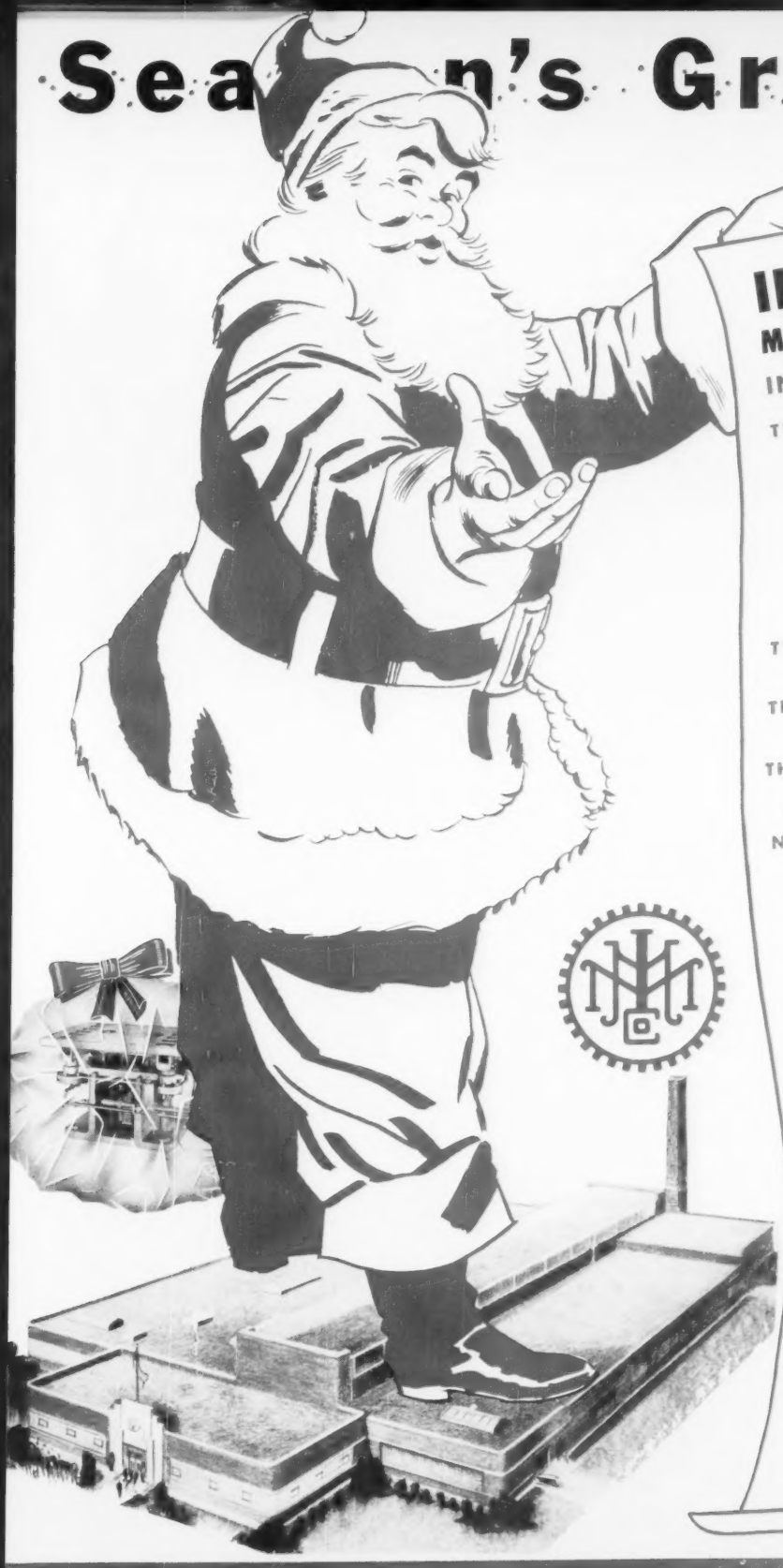


INTERNATIONAL
MOLDING MACHINE COMPANY
LA GRANGE PARK, ILLINOIS

blower and core oven, and a cleaning room of about the same area with grinding machines, blast cleaning units, and dust arrester. The foundry has areas for bench, machine, and floor molding. It is equipped with a cupola having air-weight control, an indirect arc, rotating electric furnace, and gas-fired iron pot furnace for melting aluminum, and a crucible type for melting bronze. Main section of the foundry is spanned with a 1-ton crane.

Patterns are stored on shelves on the balcony above the foundry. The classroom adjoining the foundry on the first floor level is about 20 ft square. Showers and a dressing room are available to the students.

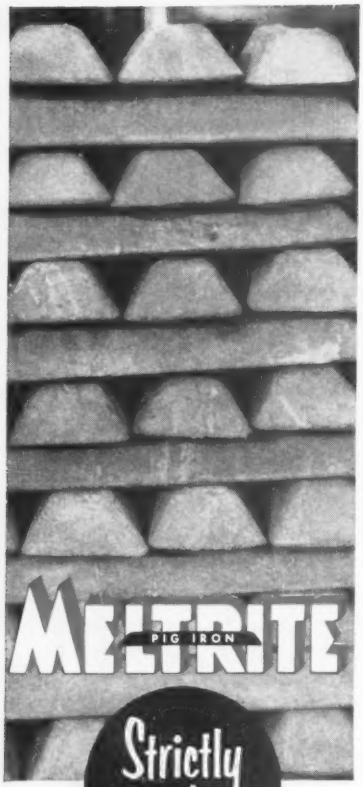
Patternmaking on Third Floor

The Patternmaking section is loacted on the third floor of the building. It occupies an area of 40 x 80 ft, including the related classroom. Ample lighting of the area is provided by glass along one side of the room and numerous fluorescent fixtures at the ceiling. The high level of illumination provides practically shadowless conditions for either day or night operations. Designed for training in both wood and metal patternmaking, the shop is equipped with an excellent array of modern machine tools for working both materials.

As it can be observed in the illustration of the patternshop, almost all of the woodworking and some of the metalworking equipment is attached to a central exhaust system. Patternmakers' benches are situated on the window side of the room.

Activities of the Max S. Hayes Trade School are directed by Dudley C. Courtright, principal, a veteran of over 20-years' service in the field. Assistant principal is Rowland C. Cukr. They are assisted by a staff of 43 full-time and 13 part-time instructors. James G. Goldie is instructor in foundry, and Frank C. Cech, assisted by Jack E. Miller, directs patternmaking courses. Apprenticeship committees from the various trades co-operate closely with the school authorities so that both are conversant with conditions within industry and education. That arrangement also has an important effect on student attitude since it is a direct indication that their efforts are not being overlooked.

Northeastern Ohio Chapter of the AFS contributed an airless blast barrel to the foundry and a milling machine to the pattern shop. A committee of the chapter participated in the early planning which led to establishment of the new school.



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Circle 639 on Page 51

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Highest Quality Foundry Coke

SINCE 1904

MILWAUKEE COKE SOLVAY

Year after year MILWAUKEE SOLVAY COKE ranks as a superior foundry coke...made from *carefully selected* coal:

1. Low in ash
2. Low in sulphur
3. High in carbon
4. Highly resistant to shatter and abrasion

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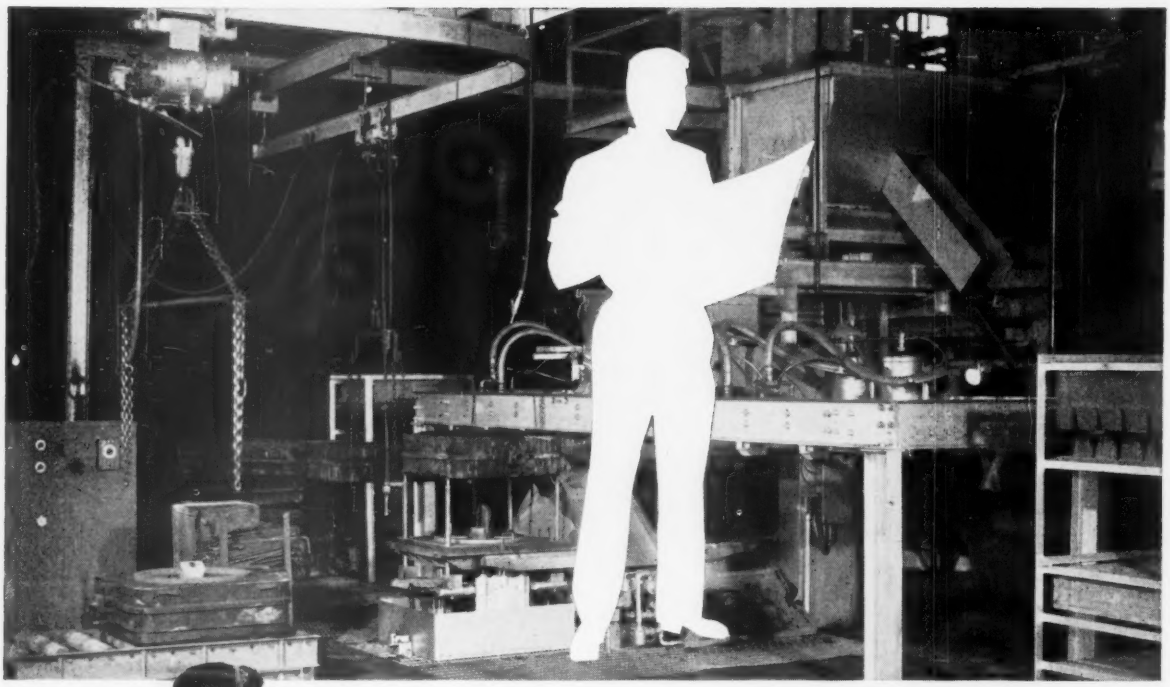

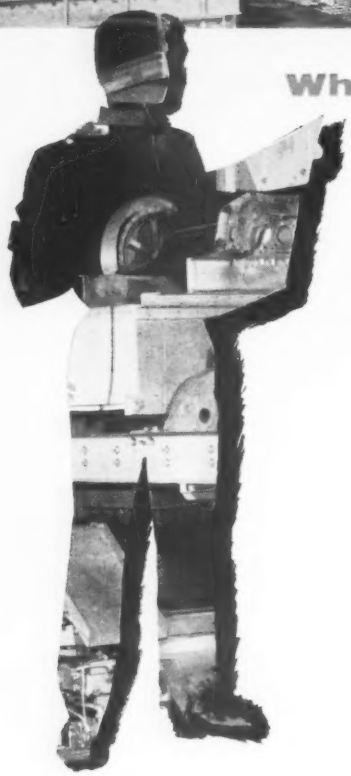

Who is your foundry's future?

Stand back for a moment and look at your foundry. Strip it down to its components. What gives it substance?

"Man, of course". you say, "the individual who blends the ingredients into a productive whole."

And it is also upon man that the growth and development of your foundry depend . . . man technically trained and soundly indoctrinated in the field of foundry science and engineering.

But what investment are you making in that man; what are you contributing to his education today, for your greater benefit tomorrow?

Through the efforts of the Foundry Educational Foundation, and its participating members, about two hundred fifty graduate engineers are available to the foundry and allied industries annually. How many will your foundry absorb to insure its future; how many can you claim as a big return on a small investment?

Write today for our detailed booklet, "Let's Look Ahead".

Foundry Educational Foundation

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Foundry Developments

By EDWIN BREMER
Metallurgical Editor

ALUMINUM transmission case announced by Buick for some of its 1958 models is reported to be setting two records in the automotive industry. It is said to be the largest aluminum casting used by automobile manufacturers and the first to combine three separate parts into a single permanent mold casting.

In the accompanying illustration Robert J. O'Grody, automotive sales manager, Reynolds Metals Co., points out the intricate valve body—heart of the transmission which, along

with the torque converter housing and gear housing, forms the integral casting. The casting weighs 26 lb. Indications are that at least two other automotive divisions will announce integrally-cast aluminum transmissions and other major components within the next 18 months.

Salt Bath Graphitizes

RAPID graphitization of high-sulfur pearlitic type cast irons is obtained by heat treatment in salt baths, according to an article "Salt-bath Graphitization as Applied to High-Sulphur Irons" by Olivier Bader and Daniel Godot in the Aug. 15 issue of *Foundry Trade Journal* (London, England). Material containing 2.69 per cent TC, 1.57 per cent Si and 0.20 per cent S and heated in a salt bath at 1814 to 1832° F for 45 minutes was completely graphitized. The structure after cooling in still air was pearlitic with no trace of undecomposed cementite. Iron showed 91,840 psi and 2 per cent elongation.

Insulator caps so treated were broken under a load of 11,200 lb, compared with 5600 lb for regular malleable. Partial ferritization of the material in an atmosphere-controlled furnace between 1330 and 1400° F at the rate of 9° F per hour gave increased elongation with not much change in tensile strength. The process, applied to insulator caps, covers and other small castings, required 50 minutes for graphitization and 8 to 10 hours for ferritization.

Employs Two Binders

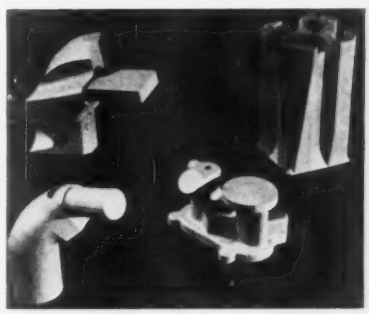
COMBINATION process claimed to overcome limitations in shell molding is described in British patent No. 778,000. Mold material is a refractory bonded with a critical amount of resin as well as an inorganic, high-temperature binder. Mold sections are made in the usual manner and heated to harden the resin. Then the mold sections are assembled and heated to 930 to 2370° F. The high temperature binder cements the refractory particles of the individual mold surfaces and along the mating surfaces of the separate sections.

Has More Muscle

GROWING need of the automotive industry for stronger castings resulted in development of a new grade of pearlitic malleable by Central Foundry Division of General Motors Corp. Called 88M ArmaSteel, the material is produced with a Brinell hardness range of 269 to 302, and is said to provide good wear resistance and high yield strength while retaining good machining characteristics. Because of the alloy's hardness, it is claimed that the user can employ it without preliminary heat treating. Typical applications of the material are in automotive transmission planet gear carriers and universal joint yokes, and use in transmission output shafts and diesel gears is being considered.

Guarantees Properties

DEVELOPMENT of new investment casting techniques by Arwood Precision Casting Corp., New York, has led to the announcement that the firm will guarantee the tensile and yield strengths, and elongation actually present in any aluminum alloy casting, and that those properties will be higher than specified for aircraft quality type. The process, known as "Suparcast," is said to improve properties throughout the casting, and can add greater improvement in critical or high-stress areas. The firm reports that the added properties of strength and ductility will permit designers to use the castings



as structural, load-carrying parts for aircraft application, subject to shock and impact. Some typical castings produced by the new manufacturing process are shown in the accompanying illustration.

Look at the Record

ELECTRONIC extensometer and recorder which records autographically the true stress vs. elongation curve of ferrous and nonferrous metals has been developed by the Ordnance Corps. Reported to be a time saver and minimizing human error by elimination of manual measurements and calculations, the instrument is described in report PB 131104, "True Stress vs. Elongation Recorder," by D. E. Driscoll and T. S. DeSisto, available from the Office of Technical Services, Department of Commerce, Washington 25, for 75 cents.

tenth in a series . . . the Herman Jolt Machine

why foundrymen buy a HERMAN molding machine

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

Foundrymen the world over buy the famous Herman Jolt Machine because of its reputation for handling heavy duty work.

There are several thousand of them in service, performing in a wide capacity range from 615 to 140,000 lbs.

Foundrymen know a harder mold can be rammed on this machine, without damage, because it is designed to strike over the entire surface of the machine base.

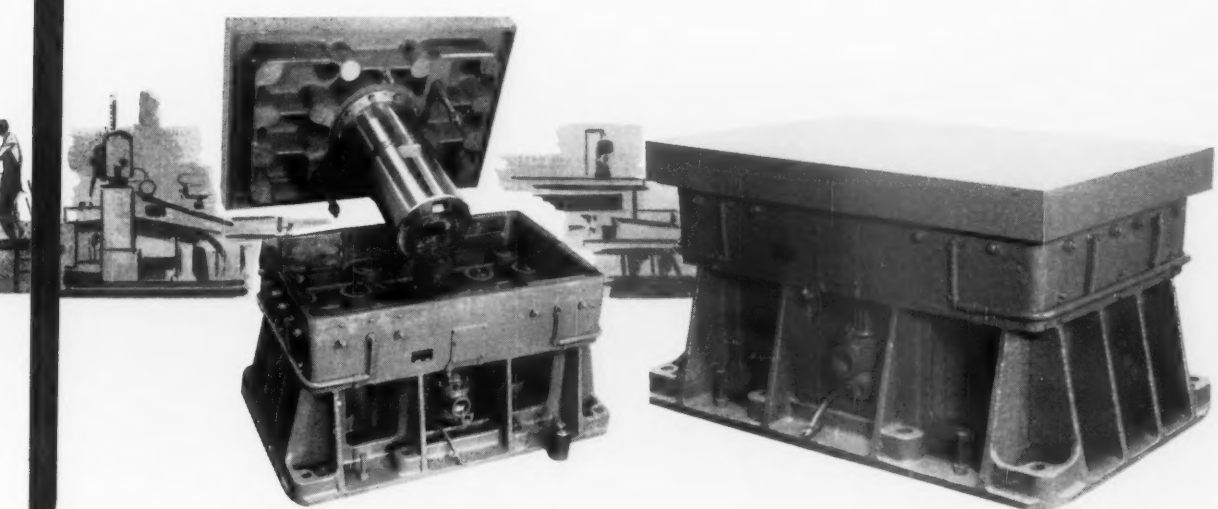
Maintenance and production costs are reduced to a minimum.

Cast steel table plates and plungers are used on all these machines. Alignment is guaranteed at all times by the use of wearing plates at the corners of the jolt machine base. Wear on the cylinder and plunger is also reduced to a minimum.

Every machine uses the Herman "Bunter-Control" operating valve which proportions the amount of air to the load on the machine.

Photos show the machine at rest and with the cast steel table plate and cast steel plunger removed for examination.

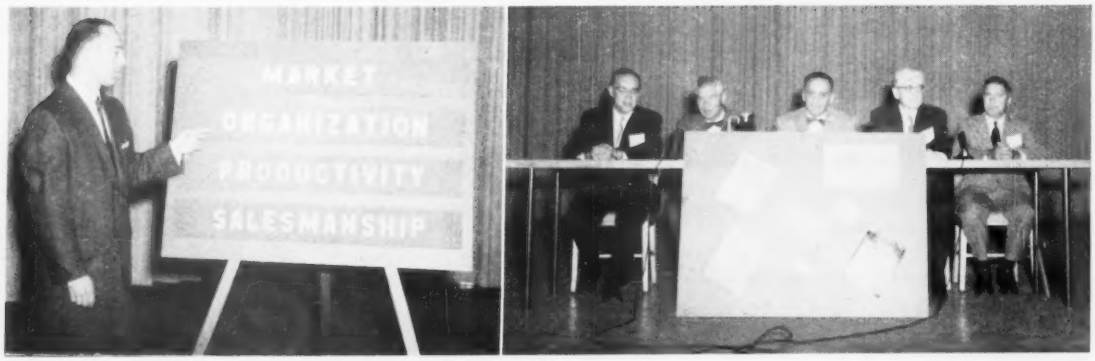
Write us for more information . . . there is a size and type Herman Molding Machine to fit every foundry operation.



HERMAN

Best Known Name in Molding Machines

Circle 643 on Page 51



Harold Brown, Metallurgical Associates Inc., spoke on "The Future of New England Foundries" at the first general session. At the right are members of the panel which supported him

New England Conference Stresses

MANAGEMENT and MARKETING

By JACK C. MISKE
Associate Editor

THE growing interest of the foundry industry in management and marketing problems received top billing at the 17th New England Regional Foundry Conference, held Oct. 18-19 at the Kresge Auditorium of Massachusetts Institute of Technology, Cambridge, Mass.

Three general sessions were devoted to various aspects of these subjects, and eight technical sessions on varied topics completed the well balanced conference program.

Albert M. Nutter, E. L. LeBaron Foundry Co., Brockton, Mass., opened the first session of the conference, which attracted a total of more than 400 New England foundrymen. This session heard a discussion of **The Future of the New England Foundry Industry** by Prof. Howard F. Taylor, MIT, and Harold Brown, Metallurgical Associates Inc. Mr. Brown presented the paper and was supported by a panel representing various types of foundries in the area. Panel members were Stafford W. Chappell, Electric Boat Div., General Dynamics Corp., Groton, Conn.; Walter P. Jacobs, Hartford Electric Steel Corp., Hartford, Conn.; Ely Portman, Stillman White Foundry Co., Providence, R. I.; George W. Roraback, H. B. Smith Co., Westfield, Conn.; and Roderick R. Washburn, Plainville Casting Co., Plainville, Conn.

Mr. Brown stated that planning for the future is vital to any business endeavor and involves four main factors: 1. Market. 2. Effective management. 3. Efficient production. 4. Salesmanship. He analyzed these factors in relation to the New England foundry industry and concluded that it has a potentially strong future.

He was unable to find any definitely unfavorable points unique to New England, but listed nine favorable points: 1. Current consumption of castings in the area far greater than the local supply. 2. A good labor market. 3. Good living conditions. 4. An academic and intellectual atmosphere which trains good men and encourages them to work and live in New England. 5. A good scrap market. 6. Reasonable labor rates. 7. Corporation taxes which are not proportionately high in relation to other, more significant manufacturing costs. 8. Development of strong, new industries. 9. The fact that more businesses of all types are developing in or moving into New England than are moving away.

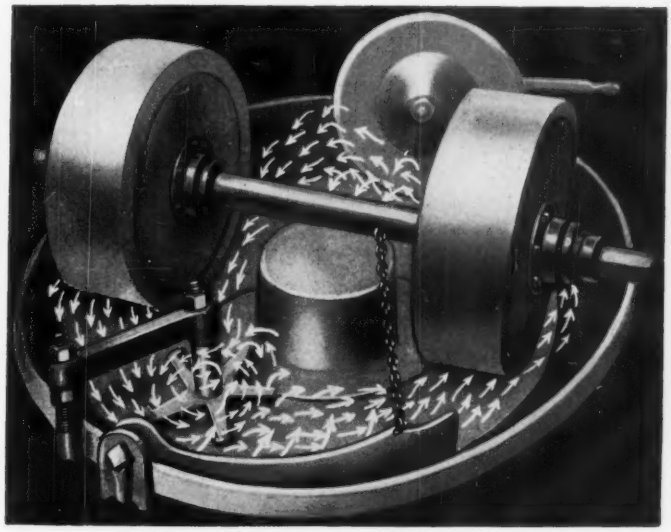
After Mr. Brown's presentation, each member of the panel discussed a facet of the central question. Mr. Chappell dealt with captive foundries, for which the basic goals are quality production and fast delivery. Price cannot be out of line, but is less a factor when quality and delivery are good. Mr. Jacobs said that New England foundries have lagged in sales of high-specification castings, but can and should get into the field. Mr. Portman emphasized that jobbing foundries must get a full, fair price for their products. Price cutting based on ignorance is ruinous to the entire industry, he asserted.

Mr. Roraback discussed the need for foundrymen to know and believe in their products. Castings have unlimited possibilities, he said, and he advised foundries to guide designers and train workers properly. Mr. Washburn dwelt on the need for constructive planning and accomplishment rather than preoccupation with high costs, poor sales, etc. He stressed that almost any foundry can justify the use of engineers and recommended that each plant do the type of work it is set up for and turn down the rest.

At the second general session, Richard C. Meloy, marketing director, Gray Iron Founders' Society, Cleveland, asked **Are You Giving Your Customer What He Really Needs?** Finding out what a customer wants and needs requires digging. That digging was supplied by a GIFS survey which got replies from more than 700 purchasing agents and 1500 design engineers. The latter were included because they decide whether or not castings are to be used in the first place.

Results showed that 66 per cent are interested primarily in quality, 18 per cent in price, and 16 per cent in delivery or service. They want the best price only after they are

the STAR feature of a CLEARFIELD MIXER



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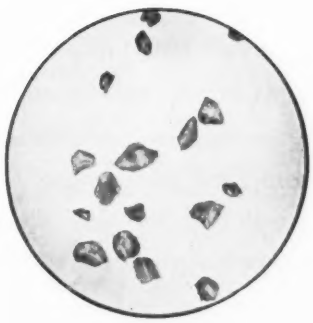
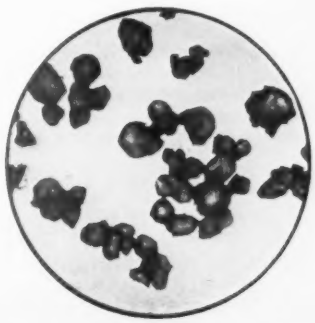


VISUAL EVIDENCE of the effectiveness of Clearfield Mixers is provided by these photomicrographs. Left, unbonded silica sand. Right, the same sand bonded in a Clearfield Mixer.



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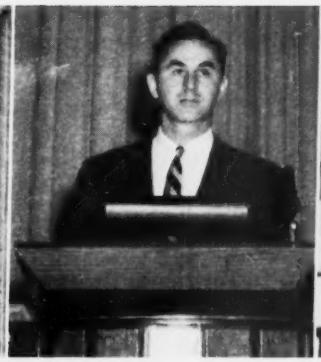

WILLIAM R. LYSOBEY

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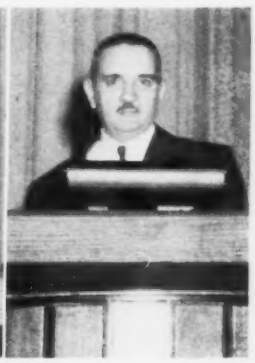


JOHN F. BERTUCCIO

assured of satisfactory quality. Pricing on a per-piece rather than a per-pound basis was favored 2 to 1. Suggestions from foundrymen as to design improvements and cost reductions are welcomed by a large majority.

At the concluding general session, Glenn C. Cook, manager of marketing, General Electric Co., Foundry Div., Schenectady, N. Y., discussed **Managing a Foundry Professionally.** Good management, Mr. Cook said, makes profits when poor management is suffering rough weather. It watches for product changes and gears planning accordingly—in other words, it knows its markets and their futures.

Mr. Cook listed four characteristics of good management: 1. It identifies and gives balanced attention to all key result areas. 2. It gives well balanced attention to all functions of the business, without overemphasis on manufacturing. 3. It projects its plans as far ahead as possible. 4. It manages its own personal time and does not let the job push it around.

TECHNICAL SESSIONS

Epoxy Resins for Foundry Patterns, by M. K. Young, United States Gypsum Co., Chicago—Use of epoxy resins for pattern equipment not only permits old jobs to be done better or cheaper, but also opens the door to new areas of work for wood patternmakers, who can do work which formerly went to tool and diemakers. Epoxy resins offer low shrinkage, heat resistance, stability, room-temperature cure, long-wearing characteristics, speed, and economy. In addition, they can be repaired easily with the same material.

Design for Quality, by Robert A. Colton, Federated Metals Div., American Smelting & Refining Co., Newark, N. J.—Four basic considerations govern the design of quality castings. These points include use of the casting, the alloy to be used, castability of the design, and design rules. In brass castings, poor gating and risering are responsible for the greatest number of defects. In aluminum, bad pouring practice does the most damage. Close attention to details in design of the gating system and the manner in which the mold cavity is filled can do much to improve casting quality. Aluminum must be handled at all times so that no air or dross reaches the castings.

Which Core Process, by Anton Dorfmueller Jr., Archer-Daniels-Midland Co., Cleveland — Foundrymen now have four major coremaking processes from which to choose—conventional oil-bonded cores; shell cores; airsetting cores; and gas-setting (or CO_2 process) cores. Each has its own areas of potential application. See FOUNDRY, May, 1957, p. 180.

Oil-Bonded Molding Sands, by Robert A. MeGaw, Baroid Div., National Lead Co., Chicago—Molding sand bonded with a proprietary waterless binder releases less gas and has less chill effect than conventionally bonded sands. In addition, finer sands can be used because permeability requirements are lower. The sand mix consists of washed silica, binder, oil, and a catalyst. Rebonding, with oil alone or with oil and binder, is infrequent and depends on heat. Higher pouring temperatures and fast shakeout of hot castings require more frequent rebonding. AFS fineness of sand used is 120 to 180.

Claimed results include better finish and tolerances and less cleaning. The sand mix can be used as a facing, but ability to re-use it makes full molds practical. Ordinarily, it needs only to be riddled after use. Thus far, best results have been obtained with nonferrous metals because of their lower pouring temperatures. Smoke at shakeout can be a problem.

How To Use Foundry Manpower

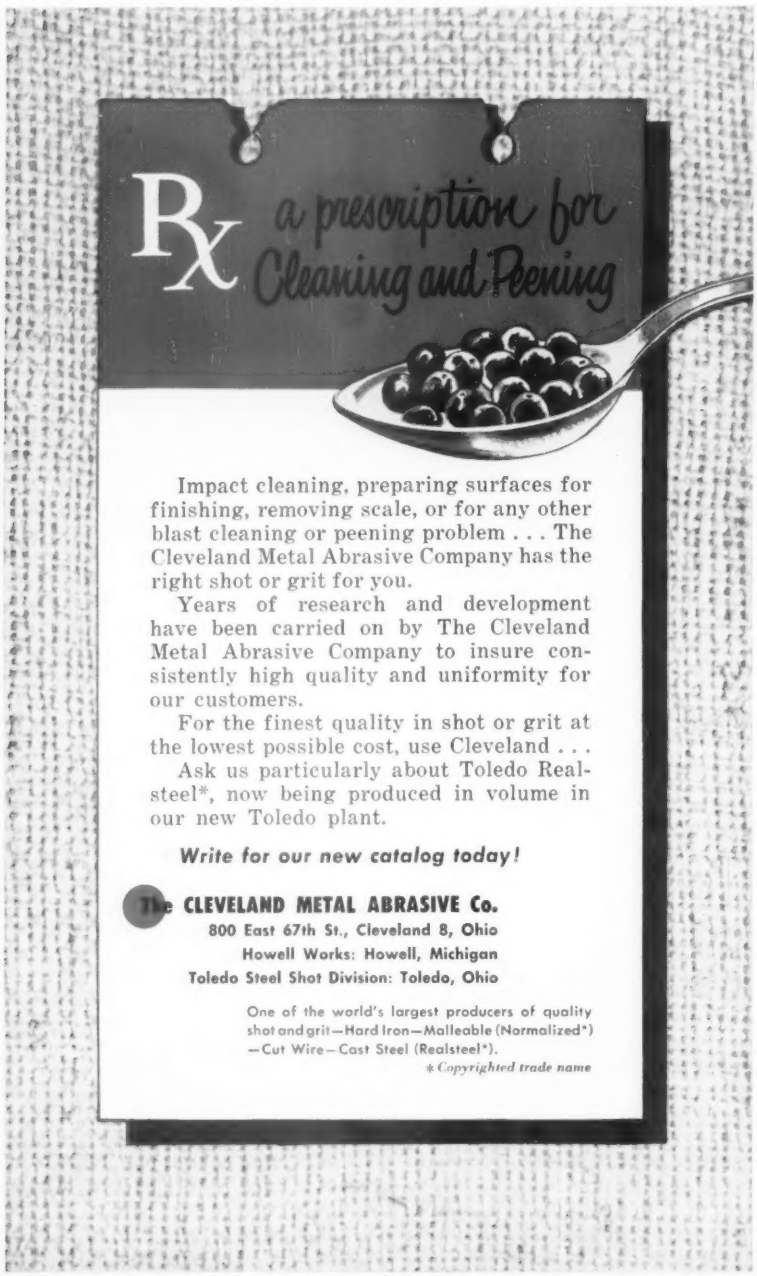
Effectively, by H. M. Palmer, Lewis-Shepard Products Inc., Watertown, Mass., and John F. Bertuccio, J. C. Corrigan Co., Boston—Mr. Palmer discussed foundry applications of industrial lift trucks. Modern material handling consists of converting material from a size and shape suitable for manual handling to a size and shape suitable for mechanical handling. This point is particularly important to the foundry industry, which handles 250 tons to ship 1 ton of finished castings, whereas the average for all industries is around 100 tons to a ton of finished product.

Mr. Bertuccio discussed the use of conveyors for foundry applications. He pointed out that automation and mechanization can be either a boon or a headache, depending on the planning they are given. Bulk handling is a common business in foundries. A great deal of it can be mechanized or automated. Both make work easier, cut costs, and help to solve personnel problems. Conveyor systems can be bought and installed in parts so that they pay for themselves as a company builds up to full mechanization based on sound planning.

Practcial Mechanization for the Small Foundry, by Charles T. Koehler, Hamilton Brass & Aluminum Castings Co., Hamilton, Ohio—Guide points to evaluating mechanization include the following: 1. Reduction of labor cost, metal loss, and scrap; improvement in quality; and reduced operating and maintenance costs. 2. Let degree of mechanization be determined by type, quantity, and quality requirements of castings produced. 3. Fit type and degree of mechanization to castings being produced currently. Do not mechanize and then attempt to make the work fit the mechanization. 4. Accept the fact that mechanization will raise the breakeven point and make costs more sensitive to volume change. 5. Understand that mechanization usually increases operating and maintenance costs. 6. Don't overmechanize. Mr. Koehler went on to discuss the benefits of planned mechanization of his plant.

Applications of Metal Injections in Gray Iron, by William R. Lysobey, Air Reduction Co., New York—The calcium carbide injection process is more than just a desulfurizing technique, and it has applications in the production of gray iron as well as in that of nodular iron. It can decrease chill; improve structure where machining is difficult, especially in thin sections; improve castability; and overcome porosity in heavy sections. Type D and E structures, containing much ferrite, can be converted to type A and B structures, consisting largely of pearlite. Chill values can be checked to determine when the structure changes. This change reduces shrinkage, eliminating the need for risers; cuts hardness to specifications and makes it uniform; increases yield; raises tensile strength; and increases fluidity.

Treatment of Nonferrous Alloys, by Ronald W. Ruddle, Foundry Services Inc., Columbus, Ohio—The main purposes of chemical treatment of nonferrous alloys are reduction in melting losses, prevention of dross formation which leads to inclusions, removal of gases, and production of the correct grain structure. The precise treatment to be employed in a given instance depends on several factors, including type of melting unit and its fuel, the alloy being treated, the form of the charge, type of casting being made, and other points. Considerable experience and knowhow are necessary to select the best treatment. Expert advice generally should be obtained before a new type of treatment is employed.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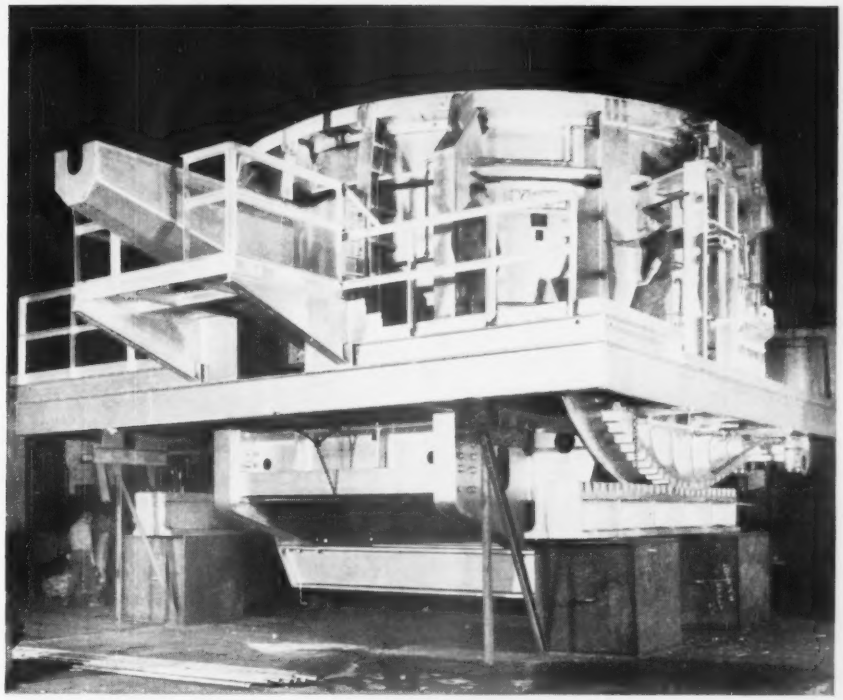

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Catalog 9-B describes Lectromelt Furnaces. For a copy, write Lectromelt Furnace Division, McGraw-Edison Company, 314 32nd Street, Pittsburgh 30, Pennsylvania.

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Circle 647 on Page 51

Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"Clay has no strength when either dry or sopping wet. It's darned finicky as to the amount of moisture it takes to be its stickiest"

Research Run Amuck

HERE lately, I've begun to suspect that I have an outstanding talent for either underdoing or overdoing just about everything I tackle. All I wanted to find out some time ago was whether my sand was worn out. After six dropouts, one after another, I suspected just about everything, including my own ignorance and clumsiness. The proportions of the homemade flask, bars or the lack of them, gaggers, nails, pattern draft—each in turn came up in court as the possible culprit, along with my own ignorance as the most likely suspect. As a last resort and maybe to save face, the sand was indicted.

Without intending to make a career out of my problem and with no budget for buying sand testing apparatus, I thought that there must be some simple way of telling roughly whether the sand in my heap had given up the ghost. The quest for this simple approximating test has lasted for four years and still continues.

I had read some place or had been told of ramming up a straight, cylindrical green sand core and pulling it on a piece of paper over the edge of a book or a block until a piece broke off by its own weight. The length of that piece was supposed to indicate the strength of the sand. I even went so far as to make a slick little core pusher with a rack, pinion, knurled knob, and graduations for measurements. But, no soap—the results wandered all over the lot.

Tried Them All—I'll just betcha that two bushel baskets wouldn't hold all of the gimcracks I thought up, made, tested, and discarded in my search for a simple and inexpensive sand strength approximater. At times I felt like a silly doodler, but like most tinker inebriates I just couldn't let the stuff alone (sand that is).

Eventually, my search narrowed down to a tensile test. Even this narrow path is now fenced in on both sides with discarded Goldbergs, some laughable to look back upon, but each made in a sincere effort to get some respectable degree of consistency in my sand studies. I don't think there is the slightest doubt that in my ignorance, I have been reaching for the moon.

After years spent in my youth on precise measurements of light, heat, pressures, power, weights, and distances, I instinctively had gotten ideas of accuracy in my head that evidently were clear out of the range of sand.

But after browsing about a bit with oldtimers in this sand testing business and taking note of the accuracies they seemed to be happy with, I began to wonder whether my discarded brain children belonged in the ashcan or not. I'm still puzzled over the reams of records kept of routine tests that are never referred to.

What, worn-out sand again!

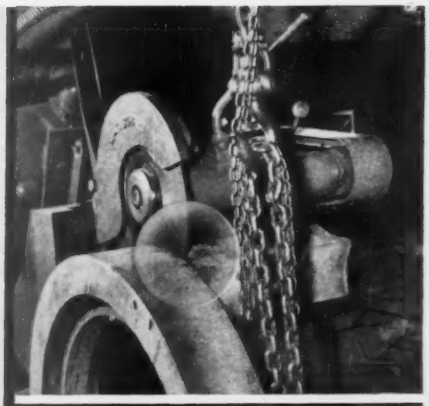
One thing that has thrown me for a loop is the wide variation in strength indications of a given sand and of a given moisture content. For a while I thought that maybe my moisture testing equipment and procedure was cockeyed. To make sure, I went over it with a fine toothed comb. I checked and double checked until I knew darned well it was right on the button.

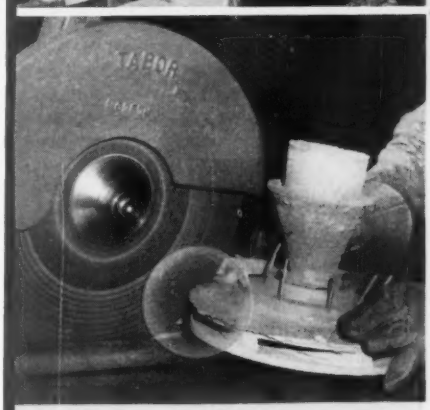
But even so, until quite recently I had one heck of a time moisturing samples of sand to a predetermined point—not only samples, but the heap also. I have my thumb behind my galluses as I forthrightly proclaim that I now can produce sand samples or specimens with a definite moisture content or know the reason why, which is equally important. Evaporation during sampling, riddling, mixing or whathaveyou was the witch I was wrestling with. I've got everything involved undercover now, leakproof. I've found that when you are fooling around somewhere between 2½ and 3 per cent on a dry day, you have to look out, or you don't know what you've got.

In the Lee Hobby Foundry routine, we've worked out a formula to allow for runaway moisture. It's certainly a lot of fun to hit the bullseye right on the button. It'll take an awful lot of loud talking and table pounding to convince me that a series of consistent strength test readings can be made on a heap of bank sand which has been conditioned with sweat, sprinkling can, shovel, and riddle.

Peeps through the microscope and

For all-around usefulness ...you can't beat the BN





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You can use it on your portables, bench stands, swing frames, floor stand grinders and on any type of heavy or light duty cut-off machine — and you'll profit by its money-saving "Touch of Gold" every time it goes into action.

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Circle 648 on Page 51

dozens of tests make me rather stubborn on this point. I find that a lot of the clay is in little balls with no sand handy to stick to when they're all wet. Besides, these little balls frequently are collected into little colonies instead of being scattered evenly throughout the heap, in spite of all the riddling, shoveling, and sweat.

It Takes Its Time—But the real strength thief in the sandpile seems to be the wickerosity—or let's say the blotterosity. What I mean is the thirstyness of the sand for moisture and the sweet old time it takes to sop it up. It begins to look as though all of those tiny little cracks between all of the grains of sand, dust, dirt, and whathaveyou have to get their fill of moisture before they share it with the clay. To me, it begins to look as though moisture can't be hurried on its capillary way even though you pummel the heck out of it. It takes its own sweet time to climb up the wick or blotter.

I've had some fun watching it do the trick. I've filled a clear, straight-sided bottle with dry sand and turned it over onto a piece of blotter with a felt wick under the blotter and its end dipping down into a cup of water. You can see the sand change color as the moisture creeps up. Here's another byway calling me from the straight and narrow.

Now I begin to understand why I saw wooden sand troughs with tight covers in several foundries I visited—foundries doing a super duper, precision sort of work. Sixteen hours of tempering under a moistureproof heap cover is what it takes to satisfy the employees in the Lee Hobby Foundry (bank sand).

But even then the strength of this very same sand can be increased from 100 to 150 per cent by a few minutes of thorough power mixing. As far as I can see, this mixing breaks up the colonies of clay balls, and the clay balls themselves, then distributes the clay more evenly between the sand and gunk grains—this, rather than trying forcibly to rub the nose of each grain of sand into clay. Ignorance sure gives a fellow a lot of freedom and fun.

Clay Has the Muscles—It's beginning to dawn on me that when we say sand strength, either compression or tensile, we don't mean that at all because we know that sand hasn't any strength: It's the clay. And dry clay hasn't any strength; neither has sopping wet clay. Somewhere between these two is a tiny little, very narrow margin. From what I've found, clay is darned finicky as to the amount of moisture it will take to be its stickiest or, getting technical, to have its greatest stickiosity. One of these days I'm going to leave the sand out of my mix and go to it dynamometering the glueability of clay. I can just see the little rig: Two discs, stuck together with various clays and sort of a scale arrangement for pulling them apart with a beam and a sliding weight. Boy, what fun!

I hope this article will serve as a warning to foundrymen trying to fight off their craving for promiscuous and intemperate research guzzling. To be on the safe side, however, we've got to have sufficient will power to take it or leave it alone. Maybe we'd better start Tinkerolics Anonymous, with me as a charter member.

Oh, by the way, it wasn't the sand after all that was causing my dropouts. It was an uneven lift. I was trying to do it all by myself with a hoist. An oldtimer dropped by and showed me what to do to be saved. I finally got a good one. Another thing—I believe I now am able to test the strength of almost any sand or mix quickly and to duplicate the tests within very small limits of variation.

Book Review

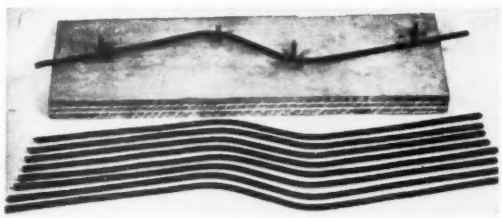
Manufacturing Processes, by Myron L. Begeman, cloth, 6 x 9 in., 612 pages, published by John Wiley & Sons Inc., 440 Fourth Ave., New York 16, N. Y. Price $8.

Revised fourth edition provides a comprehensive survey of manufacturing materials and processes, with considerable emphasis upon casting. Foundry equipment and procedures, patterns, melting and casting metals, special casting methods, and heat treatment of steel are given attention. Advantages and disadvantages of various processes are examined.

HOW TO DO IT

Jig for Bending Core Wires Saves Tedious Work and Production Time

By F. J. McCULLOCH
Six Chestnut Drive
Lenzie, Glasgow, Scotland



BENDING CORE WIRES can consume much of a coremaker's production time. A simple jig such as that shown here saves time and reduces the work of bending support wires.

The wire illustrated is used in an 8 x ⅜-in. core, forming an oil duct in a thin-sectioned cast iron casing. Prior to construction of the jig, wires were bent by hand, using the corebox cavity as a means of measurement. The shaping procedure was a matter of trial and error and consumed much of the coremaker's time.

The jig consists of a piece of wood into which are driven a suitable number of appropriately placed nails. Correct locations for the nails were found by experiment, one or two trial bends with some odd pieces of wire soon indicating the required positions. Due allowance must be made for recoil characteristics of the wire.

Such a jig is helpful for emergency needs or for jobs in which volume of work does not warrant use of a wire bending machine.

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

B&C jobs are tough, their core oil tougher!

Located in Chicago's south side, B&C Foundry is a small jobbing foundry which serves the diverse industries located in its area.

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"Fortunately, we found that 'right' core oil in Cities Service Delco #936," says President Alex Cosmos. "Not only has Delco #936 ended the blows that other oils gave us, it also enables faster mulling, makes stronger cores, and yet shakes out easily. It's everything a core oil should be."

Whether your foundry is large or small, your work specialized or diversified, you'll find Cities Service Core Oil is "everything a core oil should be." For precise recommendations, talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, 20 North Wacker Drive, Chicago 6, Illinois.

Tough Grind? "Well, no foundry operation is a breeze—but the unusual quality of Cities Service Delco Core Oil makes ours a lot easier," says President Alex Cosmos.

Where Core Is Crucial. "We had trouble with blows before using Cities Service Delco Core Oil," says Mr. Cosmos. "It stopped blows, enabled stronger cores."

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QUALITY PETROLEUM PRODUCTS

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Foundrymen Meet at Purdue for

METALS CASTING CONFERENCE

By ERLE ROSS

Left to right, L. H. Durdin, AFS vice president, and Carl O. Schopp, chairman of the Purdue Conference

TECHNICAL papers and addresses at the 10th annual Metals Casting Conference at Purdue University, Lafayette, Ind., Oct. 31-Nov. 1, tied in with the theme "Practical Foundry—Today and Tomorrow." Both operating and management topics were discussed.

The conference was sponsored by the university's School of Chemical and Metallurgical Engineering and Division of Adult Education and the Central Indiana and Michiana Chapters of the American Foundrymen's Society. Registered attendance exceeded 160, and students in metal processing classes also sat in at various sessions.

Carl Schopp, Link-Belt Co., Indianapolis, conference chairman, presided at the opening session, at which Dr. Paul Chenea, associate dean of the schools of engineering and acting head of the school of electrical engineering, welcomed conference participants on behalf of the university.

Official welcome to the conferees from the American Foundrymen's Society was extended by its vice president, L. H. Durdin, president, Dixie Bronze Co., Birmingham. After reviewing the society's growth and record for 62 years, he did some "visioneering" for the future. Subjects commented on included training of foundry personnel and co-ordination of trade association and technical society efforts.

C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, spoke in his role as president of the Foundry Educational Foundation. He said the FEF is much concerned over changes taking place in the engineering curriculum at Purdue and other schools as a result of pressure from larger industries for graduates trained for scientific research. The foundry industry needs engineers with practical training for operating foundries, and few shops can carry on their own programs to provide such training.

FEF is convinced it is on the right track in its university-level program for training foundry engineers, and it is broadening its activities in that direction. Recently, it added Virginia Polytechnic Institute to its list of

Conference committee included, left to right, Dallas F. Lunsford; Joseph B. Essex; Carl O. Schopp, conference chairman; William E. Patterson, program chairman; James C. Maggart; and Prof. C. T. Marek

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The rather simple procedure of painting a thin coating of a 'dag' dispersion on chills can effect real economies in the production of metal castings. A highly refractory dry lubricating film is formed, which prevents the casting from fusing to the chill, while greatly improving surface qualities as well.

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Foundrymen everywhere rely on 'dag' since it tolerates any temperature met in the foundry, does not adsorb harmful gases, is chemically inert, and contributes much to over-all high-quality production.

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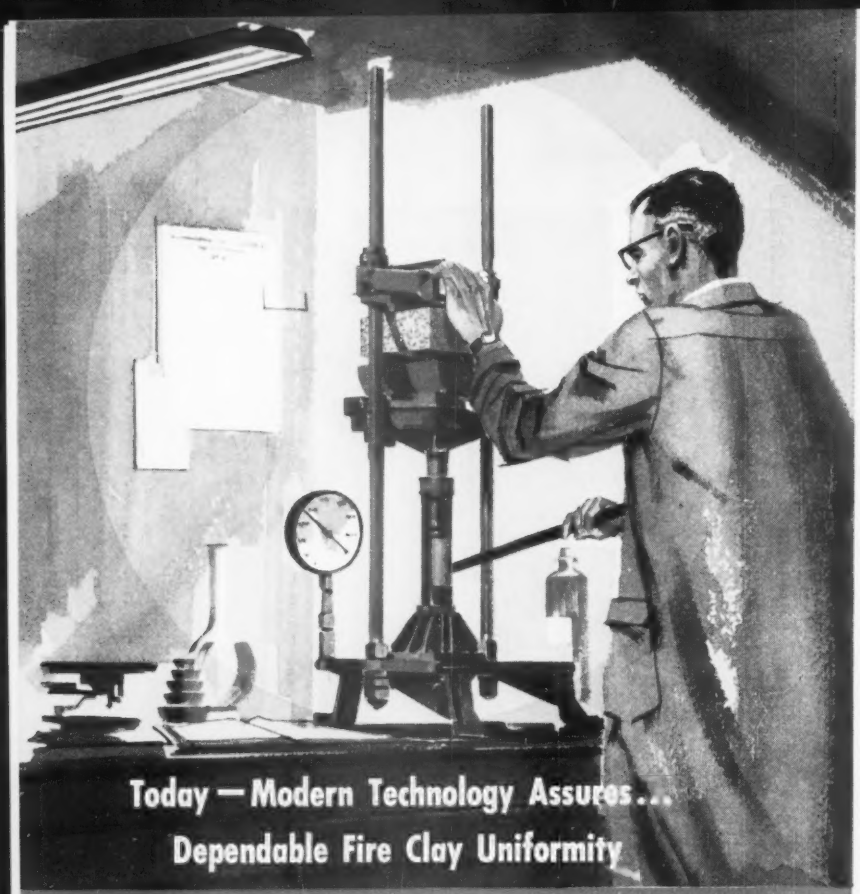

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sponsored schools. Mr. Nass warned that a foundry that cannot afford a technically trained man will fall by the wayside. Foundries do not, however, always use engineers to best advantage. For example, they frequently use engineers where they should be using technicians.

He also announced that FEF has decided to go into technical institutes with its program. This step will be taken without detracting from the college-level program.

At this point, chairmanship of the meeting was assumed by Joseph B. Essex, Golden Foundry Co., Columbus, Ind. He introduced Richard B. Stoner, Cummins Engine Co., Columbus, Ind., who spoke on **What We Expect from our Suppliers.** Mr. Stoner said he had conducted an experiment to ascertain what his company expects of its customers and what the company is like to the customers. It brought out clearly, he revealed, that this is a two-way street and "maybe we have been running on it as though it were a one-way street."

First thing Cummins looks for in a customer is integrity. Further, it wants its customer to be profitable, growing, financially sound, and possessed of sound personnel planning. Having applied these tests to its customers, the company feels it natural to apply the same tests to its suppliers. Requirements include integrity, profitable operation, growth, progressiveness, financial soundness, and good management. Summing up, Mr. Stoner said, "We expect of our suppliers what we want of our customers and what we hope we are to each other."

Henry Felten, Peoria Malleable Castings Co., Peoria, Ill., presented a paper on **Practical Scrap Reduction.** Mr. Felten made it clear that he was not theorizing about a new technique, but was trying to show how practical applications of existent techniques can reduce scrap. Management wants a program that will result in consistent scrap reduction and permit it to predict not more than a normal variation from month to month. Department supervisors want a program that will detail problems so that corrective action can be properly directed. The molder respects a program that assures him fairness in the assignment of responsibility for scrap. To this end, his company uses the "average-job" quality control system. For full details, see FOUNDRY, March, 1957, p. 123.

Closing feature of the first day's technical sessions was a four-part symposium on green sand molding. Diaphragm molding was discussed by W. C. Cheek, Central Foundry Div., General Motors Corp., Danville, Ill.

Automatic flask indexing is necessary to take advantage of diaphragm molding. Flasks 23 x 26 in. were used in experiments at Central Foundry Div. The process is air operated, but electrically controlled. Squeezing takes only 2 seconds. A force of 54,000 lb is applied in the squeeze, with existing line pressure of 90 psi. The squeeze forces the sand down 3 to 3½ in. in a flask 8 in. deep.

Advantages of diaphram molding include elimination of jolting, vibration and noise; uniform mold hardness; better casting quality; and easy adaptation of the process to automatic operation. Disadvantages are short diaphragm life, soft mold edges; difficulty of using chills and chaplets, and need for stronger flasks.

Discusses Stack Molding

George E. Miller, San-Blo Dept., Archer-Daniels-Midland Co., Cleveland, discussed stack molding. This method is used chiefly with malleable and gray iron, but sometimes in steel and nonferrous foundries. Stack molds must be of better quality than ordinary molds, and their top and bottom faces must be parallel. Special sands are not needed.

Stack molding offers a means of reducing the cost per casting because only about half as much sand is used per casting as in cope and drag molding and because shakeout is easier and less floor space is required. It is, however, limited to small castings. Gating and pouring pressures must be watched, and rigging costs are higher.

Jolt-squeeze molding was discussed by C. H. Lambert, Eberhard Mfg. Div., Eastern Malleable Iron Co., Cleveland, who described an automated jolt-squeeze molding installation in his plant. The possibilities of a higher degree of mechanization, or automation, were examined for these reasons: 1. To lower operational costs and increase profit margins, yet remain competitive. 2. To increase interest and skills in the foundry. 3. To reduce absenteeism and similar problems. 4. To increase productivity and quality. 5. To make the foundry a better place to work.

The company decided to install a completely mechanized system comprised of two complete molding and sand preparation units capable of molding eight patterns at one time—that is, four patterns to one machine. Shakeout, castings conveyor, magnetic pulley and belt, bucket elevator, and sand bin are common to both machines.

Castings produced by the automatic setup range from 1 oz to 2¼ lb. Yield is about 4 points better than in the rest of the foundry, surface

Silica Chem-Brix —a new, improved cupola block—actually cuts refractory cost per ton of iron by as much as ⅔! You can melt up to 160 tons without repairing. Unusually high slag resistance allows cleaner running slag for faster run-off. Since no mortar is used, no pre-heating is necessary. And new Silica Chem-Brix is available for any size cupola. Read how your foundry can achieve greater refractory economy in the melt zone. Write for our new booklet.

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Circle 652 on Page 51

This beat

The news from Westboro was hot. Bay State had a new cut-off wheel that cut faster and lasted longer than their topflight BZ2.

John Martin, abrasive specialist for Mau-Sherwood Supply Co., knew the BZ2 was already one jump ahead of competition. The new BZ2AA would put him *two* jumps ahead. And he set out to *prove* it.

He persuaded Peter Kriegkoff, cleaning room foreman at Cleveland Brass Mfg. Co., to give the new wheel a thorough test cutting brass valve bodies.

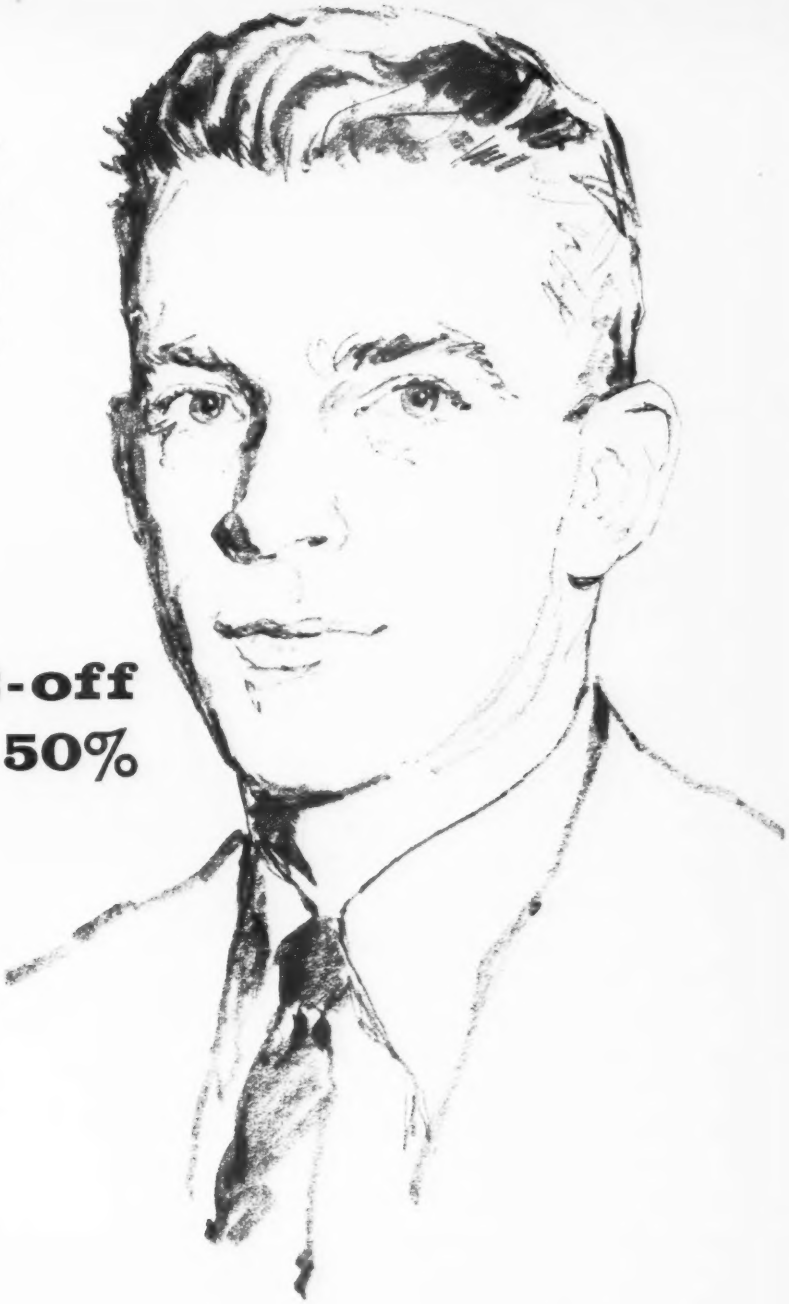
Result: Under standard production conditions, the new BZ2AA made 33% more total cuts and cut faster, too, throughout its longer life. Combined result: 50% greater cutting efficiency. Veteran operator J. C. Carter said: "It's the best wheel I ever used . . . bar none".

Explanation: Bay State has developed a new bond that closely matches the wearing and fracturing behavior of the abrasive grain. This careful mating of grain and bond gets more cuts per grain and so prolongs the life of the wheel.

That's part of what we mean by Bay State service. We don't wait to be asked . . . we never stop working to keep ahead of customers' needs. The Bay State men in your area can find practical, profitable solutions to *your* grinding problems. Why not look up your nearest Bay State distributor or branch office — or write us.

Better Grinding at Lower Cost — that is Our Business

John F. Martin of Bay State distributor Mau-Sherwood Supply Co., Cleveland, says: "Those research men in Westboro really keep us busy on our homework. It seems to me I spend half my evenings catching up with product improvement bulletins. It's okay with me, though . . . it keeps my customers happy and then some."



his best cut-off wheel by 50%

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finish and casting size are better than in the balance of the foundry, and production costs are materially less than conventional foundry costs.

Sandslinger molding was discussed by William E. Patterson, Elkhart Foundry & Machine Co., Elkhart, Ind., who stated that sandslinging is one way a small jobbing job can mechanize. It is adaptable to both dry sand and green sand work and permits a smaller foundry to remain competitive with mechanized shops.

At the conference banquet, 15 students enrolled in the Foundry Educational Foundation program were guests. Prof. R. W. Lindley, Purdue University, was toastmaster and also provided the entertainment. He played piano duets with high-fidelity recordings he had made previously on the piano and organ.

Banquet speaker was Peter Gerdes, Institute of Human Science, Chicago, who discussed **Byproducts of Sputnik.** He used differences between our armed services in the missile program to illustrate human frailties. Human engineering, he explained, is the ability to perceive, understand, and control human behavior. We agree with people because we like them. The secret of success is the ability to understand people and to get along with them. Concluding his presentation, he made a plea for better foreman training.

Hot Blast and Humidity Control in Cupola Operation as Applied to Malleable Iron Foundries was presented by Carl F. Joseph, Central Foundry Div., Saginaw, Mich.

From a metallurgical and economical standpoint, many advantages can be gained by the operation of a cupola with preheated controlled blast. Two types of blast preheaters are employed. In one, the blast is preheated by utilizing the waste sensible heat and the latent heat obtained from the combustible carbon monoxide present in waste gases that usually pass up the cupola stack. The other method of preheating uses indirect heaters with external fuel. With special-alloy heating elements, this system will preheat the blast up to 1000° F. Most installations, however, are operating under 600° F.

Advantages obtainable with preheated blast include coke savings of 10 to 25 per cent, reduced melting losses, reduced bridging at tuyeres, less oxidation of metal charge, higher thermal efficiency, more nearly uniform chemistry, increased melting rate, lower sulfur, iron which anneals more readily, hotter iron, and a lower percentage of defective castings.

Prof. Richard W. Heine, University

Circle 654 on Page 51

2 ROSS Controlled AIR UNITS

★ Help to Produce Better Castings
★ Help to Lower Production Costs

ROSS CORE OVENS

Properly controlled heat is the key to core baking that is consistently successful. Uniformity in baking in either batch or continuous ovens depends largely upon the skill with which the hot baking air is made to enter and then to circulate throughout the oven.

To accomplish this, engineers must know the behavior of air under all conditions of temperature and pressures, and how to control that air.

The consistently efficient operation of Ross Core Ovens in both ferrous and non-ferrous Foundries can be traced right back to this understanding of air movements.

ROSS CUPOLA AIR PRE-HEATERS

Here, too, the control of both the heating and the flow of the hot combustion air for the cupola charge is based on a thorough knowledge of air behavior.

The ROSS Hot Blast System delivers air up to 500°F. The new ROSS Tubular Heater ranges up to 1000°F. at 5 pounds pressure or higher. Both of these can be tied in with present cupola operations without interfering with them. Existing blowers can be used.

Why not ask to have a Ross Engineer call and discuss your problem of core curing and of getting better production from your furnace.

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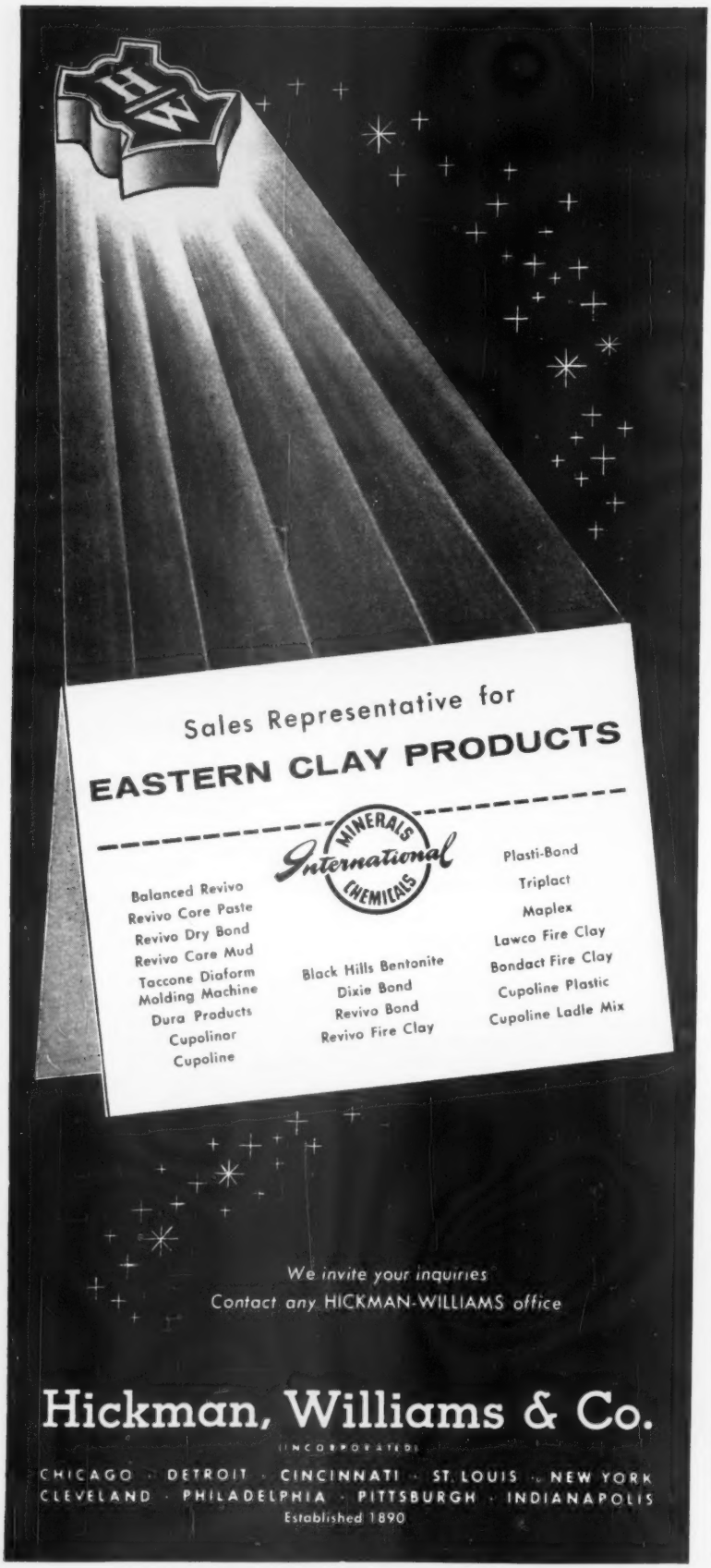

of Wisconsin, Madison, Wis., discussed **Hot Tearing.** He pointed out that although he was discussing hot tearing as it applies to malleable castings, the principles can be applied to other metals. Tears may be large or only tiny cracks. The defect is associated with contraction and solidification of the metal, but these alone do not cause hot tearing. They are combined with other factors, and the problem is to find out what these other factors are.

Types of Hot Tears

Tearing is most likely to occur where some solidification restraint is present. Prof. Heine described these types of tears: 1. Slag-induced cracks or checks when slag accumulates in a riser and gets washed into the casting. These cracks must be controlled by gating. 2. Shrinkage-type of tear, caused by unfed internal shrinkage. This type is the most common one. 3. Cracks related to stability of the mold. 4. Core tears, caused by the collapse of cores and unsatisfactory core sand mixtures. 5. Tears caused by design and stress. 6. Tears resulting from temperature gradients caused by gating.

At the final technical session, Eric Welander, John Deere Malleable Works, East Moline, Ill., discussed **Ductile Iron.** Deere has not yet made ductile iron, but has installed a melting unit and is about to do so. The company has studied more than 500 papers and abstracts on the subject and has investigated various methods of production. Ductile (or nodular) iron, in which the graphite is distributed in spheroidal form, offers the advantages of inherent ductility, good strength, good hardenability, and good machinability.

First requisite to its production is low-sulfur iron. Ductile iron can be made in an electric furnace or a cupola. Basic cupola practice is preferred to acid. Good control is required.

Disadvantages in the production of ductile iron include increased coke cost, the cost of $8 to $15 per ton to get the magnesium inoculant into the metal, and the royalty which must be paid for use of the process. The future probably will see a reduction in production costs, and eventually it may be possible to add the magnesium in the cupola rather than in the ladle.

In bringing the conference to a conclusion, Prof. C. T. Marek, Purdue University, stated that new facilities will be ready in 1958. A new Union-Hall of Music Annex now nearing completion will have more spacious and adequate accommodations for conferences.

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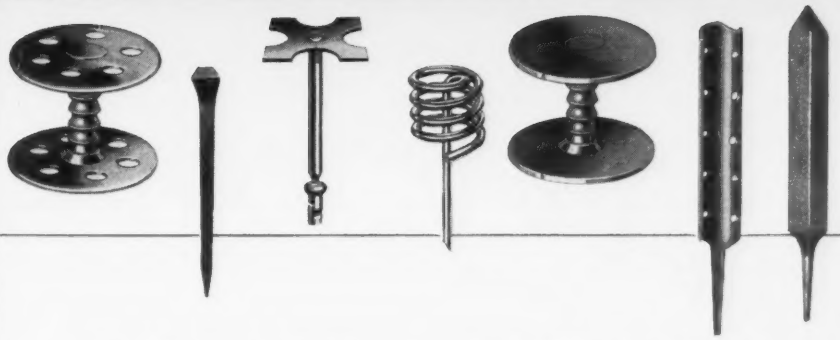

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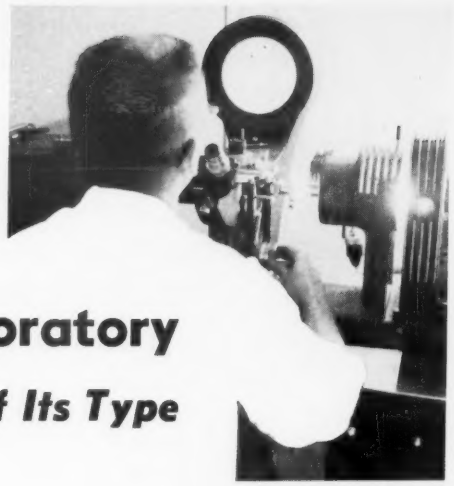
Inspecting the structure of a steel sample through the viewer of a metallograph



New Caterpillar Laboratory

Among Most Modern of Its Type

A NEW production metallurgical and materials testing laboratory was completed recently by Caterpillar Tractor Co. at Peoria, Ill. One of the world's most modern facilities of its type, the laboratory's function is to test all materials used in the manufacture of the company's machines and to develop new metallurgical practices and methods of evaluation.

The new laboratory occupies 22,000 square feet of laboratory and office space, and employs more than 150 people. It is designed to allow additional equipment to be added when necessary.

It is entirely functional in design with such features as removable steel wall panels, unitized cabinet work areas with stainless steel tops for ease of maintenance, air conditioning throughout, sound-proof fiber-glass drop ceilings, indirect lighting, stone flooring in the chemical testing area, and the latest safety devices to protect personnel and equipment.

Among the materials tested are forgings, castings, bar stock, tubing, and other ferrous metals, as well as bronze, aluminum, and brass of the nonferrous group. Rubber, cork, plastics, paints, oils, solvents, chemicals, and fibers receive extensive examination. Tests are also run on structural steel and concrete used in building plant facilities.

Working under the direction of the Peoria plant metallurgist are metallurgical, chemical, and welding staff engineers who evaluate new materials, establish testing techniques, prescribe specifications, help solve manufacturing problems, and develop new applications.

Another group, the heat treat engineering staff, initiates the planning and scheduling of all instructions for production heat treat operations. Heat treat engineers are divided into three sections: Conventional heat treat, induction heat treat, and development. Most of the applications and much of the equipment involving heat treatment used at Caterpillar were developed by the company's own people.

The metallurgical and materials division's specialized laboratories determine whether a supplier's product will be accepted or rejected. The most modern equipment for testing and analysis is employed in this work.

Virtually every type of welding technique used in industry is employed at Caterpillar's plants. The weld testing laboratory evaluates new welding products and methods and seeks to improve on present methods and processes. Ultrasonic testing is used to establish weld soundness.

In one laboratory, concrete used in building construction or repair is

Reflectoscope is used to detect internal defects and inclusions

Quantometer is used to measure amounts of various elements in metal samples in determining if buying specifications are being met by suppliers

50 points of Moly = 7000 psi

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More and more foundries find Moly the *practical* way to add strength and toughness to gray cast iron.

For Moly is easy and convenient to use. It allows continuous cupola operation, even when a special job calls for high-strength iron. It's one reason why, in 1956, the use of Moly greatly increased, even though cast iron sales generally declined.

If the use of Moly for high-strength iron isn't already standard practice in your shop, it will pay you to get the full story of how to upgrade iron, without changing normal practice. Write now for our series of bulletins "Why Moly Iron". Climax Molybdenum Co., Dept. 20, 500 Fifth Avenue, New York 36, N. Y.

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Circle 658 on Page 51

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...with J-M 3X Blazecrete® the hydraulic setting refractory

You can make longer lasting linings for ladles with J-M 3X Blazecrete, because it is spall-resistant, withstands slagging action and has negligible shrinkage.

3X Blazecrete . . . the 3000F refractory . . . is easily and quickly applied . . . mix with water like ordinary concrete, and slap-trowel to desired thickness. Hardens without application of heat. Contains no harmful irritants . . . safe even for hand application. 3X Blazecrete is furnished as a dry mix, and may be stored indefinitely without deterioration.

You'll also find 3X Blazecrete ideally suited for forming run-out spouts and for gunning parts of iron cupolas.

Send for free brochure on Blazecrete (RC-28A) describing its properties and uses. To obtain your copy—as well as additional application details—write Johns-Manville, Box 14, New York 16, N. Y. In Canada, 565 Lakeshore Road, Port Credit East, Ontario.

Whether you gun it... *or slap-trowel it...*

JOHNS-MANVILLE JM PRODUCTS **Johns-Manville BLAZECRETE**

BUILDS BETTER REFRACTORY LININGS

given a thorough testing to determine its compressive strength. In this same area, manufacturing personnel are trained to "spark test" metals in order that they can check grades of metal on the job.

Separate areas are devoted to the testing of paints, petroleum products, and rubber.

All materials not submitted to spectroscopic analysis are checked in the chemistry laboratory. Spectroscopy standards are checked here as well.

Within this area is a control group which directs the control of chemical processes in manufacturing. This group serves as a control center for the development and improvement of such processes as electroplating, phosphate pickling, wash tank solutions, rust preventives, machine coolants, and heat treat solutions.

The new laboratory's office controls group records and files test data, engineering reports, and other records. It is a source of compiling and distributing information to suppliers and to other personnel within the Caterpillar organization. A technical library is maintained to assure ready reference of up-to-the-minute information.

New Steel Founders' Manual Covers Welding Practice

Steel Founders' Society of America, Cleveland, has issued a manual entitled *Recommended Practice for Repair Welding and Fabrication Welding of Steel Castings.* It replaces a 1951 publication called *Recommended Practice for the Welding of Steel Castings.*

Necessary research for the new manual was done at Battelle Memorial Institute, Columbus, Ohio, under the guidance of Charles W. Briggs, technical and research director, SFSA. The society sponsored and directed the work and will distribute the publication.

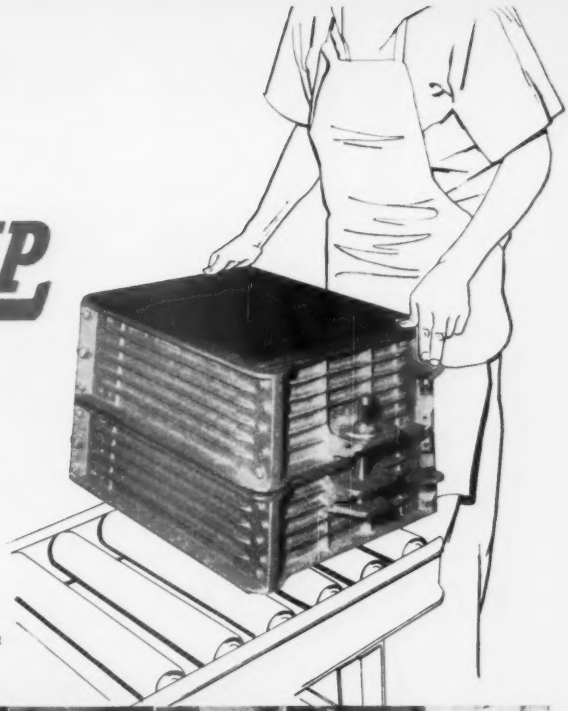
The 1957 manual incorporates the many developments in welding procedure since 1951 and features what is believed to be the most comprehensive listing of the American Welding Society Classified Mild Steel and Low Alloy Electrodes published to date. It is divided into three sections which cover welding methods, electrodes, and recommended welding procedures for carbon steel and low alloy castings. Each general alloy is indexed for quick reference and convenience.

Copies are available at 50 cents each from the SFSA, 606 Terminal Tower Bldg., Cleveland 13, Ohio.

Here's why Foundrymen are Standardizing on

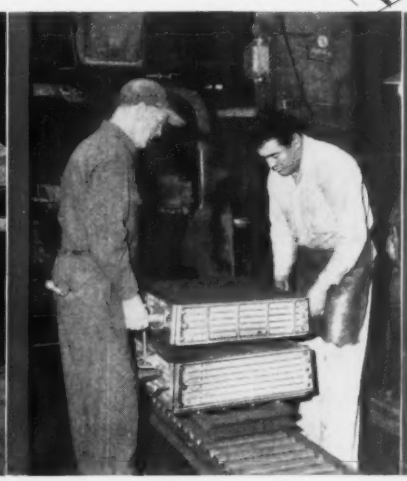
MONARCH KWIKSTRIP

MECHANICAL CORNER FLASKS



Mr. P. C. Rodger, Plant Manager of the Vulcan Steel Foundry Co., Oakland, California, has stressed these features as reasons why their foundry has standardized on Monarch KWIKSTRIP Flasks:

- Finger-tip control of handle
- Sturdiness and accuracy
- Streamlined design — no sand adheres to sides of flask
- Quick interchangeability of parts at the molding station
- Minimum maintenance.



H. C. MACAULAY FOUNDRY CO. Berkeley, California

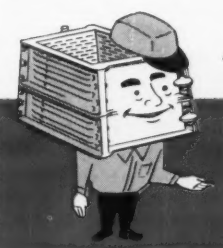
Photo above, left, shows a Monarch KWIKSTRIP Flask at use on 12″ x 18″ x 5″ x 5″ squeezer molds. Note the clean contour of the pattern impression made possible by the extreme accuracy of the flask as to squareness and taper. Smooth, easy draw is accomplished by the single round pins. Center photo shows a two-man cope and drag setup. Note the hardened steel wear strip at parting line and lifting handles. All working parts and guide bushings are cadmium plated to prevent rust. Pins are hard chrome plated.

Roy Kalin, Plant Manager, purchased the first Monarch KWIKSTRIP Flask built over nine years ago. Since then it has produced over 300,000 molds and is still in service . . . that's real proof of dependability.

PACIFIC STEEL CASTINGS CO.
Berkeley, California

Nino Davi, Foundry Superintendent, uses the Monarch KWIKSTRIP Flask exclusively, standardizing on one hex and one round pin. Photo above also shows the handle adapters in case the KWIKSTRIP Flasks are used for cope and drag setups.

Flasks are available also with double round and V-Type pins when desired.



FLASKY SAYS: "Be production wise and standardize on KWIKSTRIP"

Ask for Newaygo Bulletin 206 for Flasks, Jackets, Upsets and Accessories There's no obligation.

NEWAYGO engineering company
NEWAYGO, MICHIGAN

Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

GORDON E. SEAVOY
President

EINAR A. BORCH
Vice President

C. R. HELLER
Executive Secretary-Treasurer

FOUNDRY EQUIPMENT GROUP

Holds 39th Annual Meeting

By **WILLIAM G. GUDE**
Managing Editor

ALTHOUGH trends are mixed, a moderately favorable outlook prevails in the market for foundry equipment, according to expressions at the 39th annual meeting of the Foundry Equipment Manufacturers Association. The meeting, held at the Greenbrier, White Sulphur Springs, W. Va., Oct. 17-19, was attended by more than 150.

In the annual election of officers, Gordon E. Seavoy, vice president, Whiting Corp., Harvey, Ill., was elected president to succeed David E. Davidson, vice president, Link-Belt Co., Chicago. Einar A. Borch, vice president, National Metal Abrasive Co., Cleveland, succeeds Mr. Seavoy as vice president. C. R. Heller, Washington, was re-elected executive secretary-treasurer.

Newly elected directors are Chester G. Hawley, general manager of sales, Industrial Div., Jeffrey Mfg. Co., Columbus, Ohio; Roy I. Jones, vice president, Giffels & Vallet, Detroit, and Mr. Seavoy.

Meetings on the first day centered on topics of interest to the various product groups which comprise the major components of foundry equipment—blast cleaning and tumbling, dust and fume control, flasks, furnaces and accessories, material handling and processing, and molding machines.

President D. E. Davidson presided at the annual business meeting at which C. R. Heller, executive secretary-treasurer, reported on the association's activities during the past year. The group now has 56 members, he announced.

A panel discussion of various phases of foundry equipment marketing had R. A. Brackett, executive vice president, Spencer Turbine Co., Hartford, Conn., as moderator of the four-member panel.

H. E. Helling Jr., advertising and public relations manager, Mathews Conveyer Co., Ellwood City, Pa., pointed out that advertising is intended to provide a contact with the prospective buyer, arouse his interest, and create a preference; it is not, however, a substitute for a weak sales force. Advertising should be continuous, he said, because the advertiser's audience constantly is changing.

In discussing direct selling, C. H. Barnett, assistant to the president, Foundry Equipment Co., Cleveland, listed these factors as important considerations in the salesman's recommendation for the purchase of equipment: Knowledge of the customer's requirements; competence of its engineering and maintenance staffs, and quality of its plant personnel; housekeeping practices employed; economic justification of the installation. It should be remembered that both the seller and the buyer have to live with a product after its sale.

Various means are available for maintaining high-level performance of equipment after it is installed, according to J. R. Bloom, treasurer, Davenport Machine & Foundry Co., Davenport, Iowa. Field service work can be handled by subcontracting with outside agencies, or by dealers, although many of the latter are not qualified or desirous of doing it. The best but most expensive practice is for the manufacturer to send out engineers.

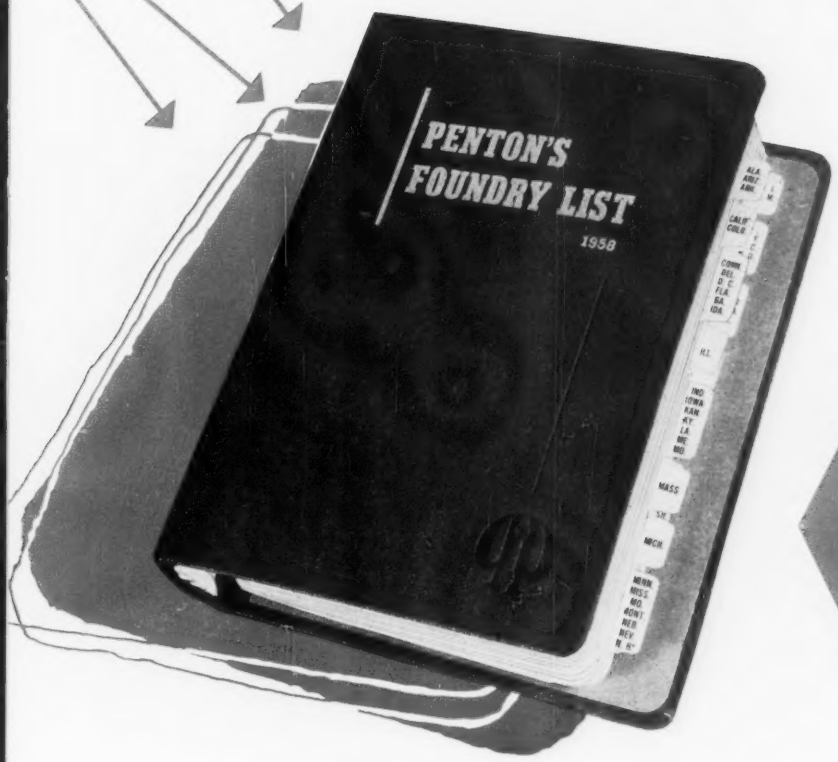
Mr. Bloom suggested that sales engineers be trained to spot minor operating difficulties before they become major ones. It is also desirable to maintain close inspection in manufacturing which will obviate early breakdowns of equipment in service. Bulletins covering operating instructions and parts often go to the wrong persons or are misplaced; both the purchasing agent and shop personnel should have copies.

Sales contracts should put in writing all of the conditions which arose during negotiations, said C. G. Hawley, general manager of sales, Industrial Div., Jeffrey Mfg. Co., Columbus, Ohio. The contract must be fair to both parties; it should tell what the equipment will do and the product to be handled. Specifications should include descriptive drawings and photographs, with sufficient details to avoid the possibility of later controversy.

Among other conditions to be incorporated are the delivery promise, terms of payment, and responsibilities of both buyer and seller in event of various contingencies. The sales contract, by being made attractive

New Foundry List

"Available for Immediate Delivery"



Who? Where?

Metals Melted?

Melting Equipment & Capacity?

Departments Operated?*

Casting Methods?*

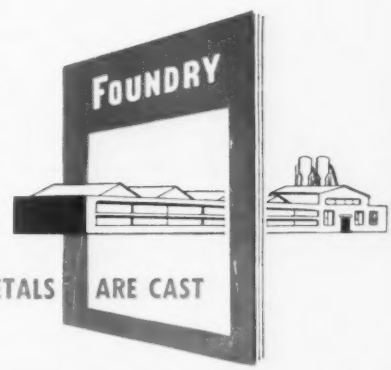
(*) The new, 1958 PFL will include these added features for the first time: a complete list of companies doing die casting and an indication of foundries with heat treating and radiography departments.

• For many years, FOUNDRY has conducted an intensive census of the foundry industry in the United States and Canada . . . every two years, basic information on all foundries is published in *Penton's Foundry List and Directory.*

The 1958 Edition of PFL is now available. It gives comprehensive information on more than 6,300 metal casting plants in the U. S. and Canada. It tells who they are and where they are located; what metals they melt, their melting equipment capacities, and departments operated.

Well-indexed, and in loose-leaf form, PFL is indispensable to casting buyers and foundry suppliers. For prompt delivery, write: Book Department, FOUNDRY, 1213 West Third St., Cleveland 13, Ohio.

PRICE: $130.00 PER COPY.



Helping You Sell To Foundrymen

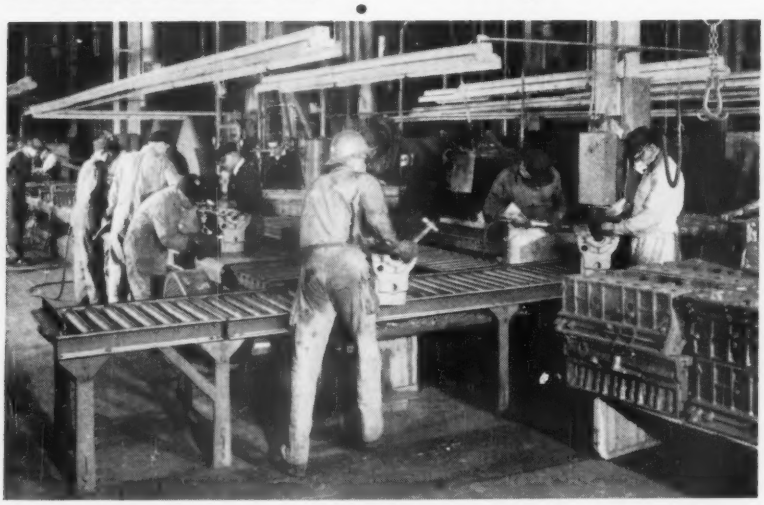
WHEREVER METALS ARE CAST

A PENTON PUBLICATION, PENTON BUILDING, CLEVELAND 13, OHIO

Circle 661 on Page 51

Ask Standard

how to cut costs with conveyors



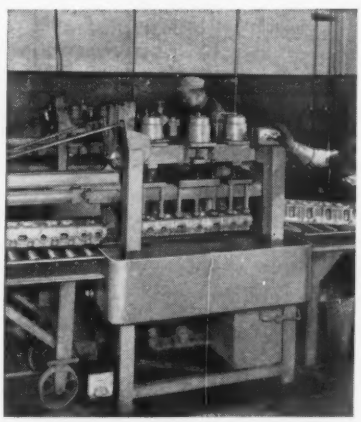
Cylinder blocks are chipped, ground and inspected on Standard Roller Conveyor line.

Eastern foundry simplifies cylinder block handling with roller conveyors

HERE'S another installation in which Standard Roller Conveyors are keeping heavy, bulky components flowing to machining and assembly points with minimum manpower and practically no time loss.

Easy to set up and exceptionally sturdy, Standard Roller Conveyors (live or gravity) can also be job-tailored to your specific materials handling problem — permanent or temporary.

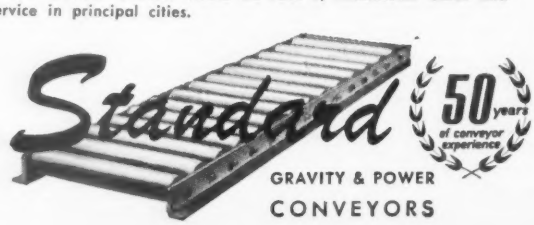
And roller conveyors are only one of the many types of Standard conveyors. Others include belt, slat, chain, pushbar or sectional conveyors as well as spiral chute systems.



Standard Roller Conveyors are available from stock in a wide range of roller diameters, centers and frames.

Call the Standard engineer listed in your classified phone book or write direct for Bulletin 68 — Address Dept. N-12.

Why not take advantage of Standard's half-century of conveyor application experience. Consult STANDARD CONVEYOR COMPANY. General offices: North St. Paul 9, Minnesota. Sales and service in principal cities.



as well as complete, can become an effective sales tool.

Commenting on general business conditions, Einar A. Borch, chairman of the FEMA Statistical Committee, indicated that the prospective decline in capital investment would have only a relatively small impact on gross national product. Expenditures for plants and equipment are far outweighed by spending for personal consumption and for federal, state, and local governments. Mr. Borch also presented an interpretation of the society's monthly statistics and an analysis of industry activity.

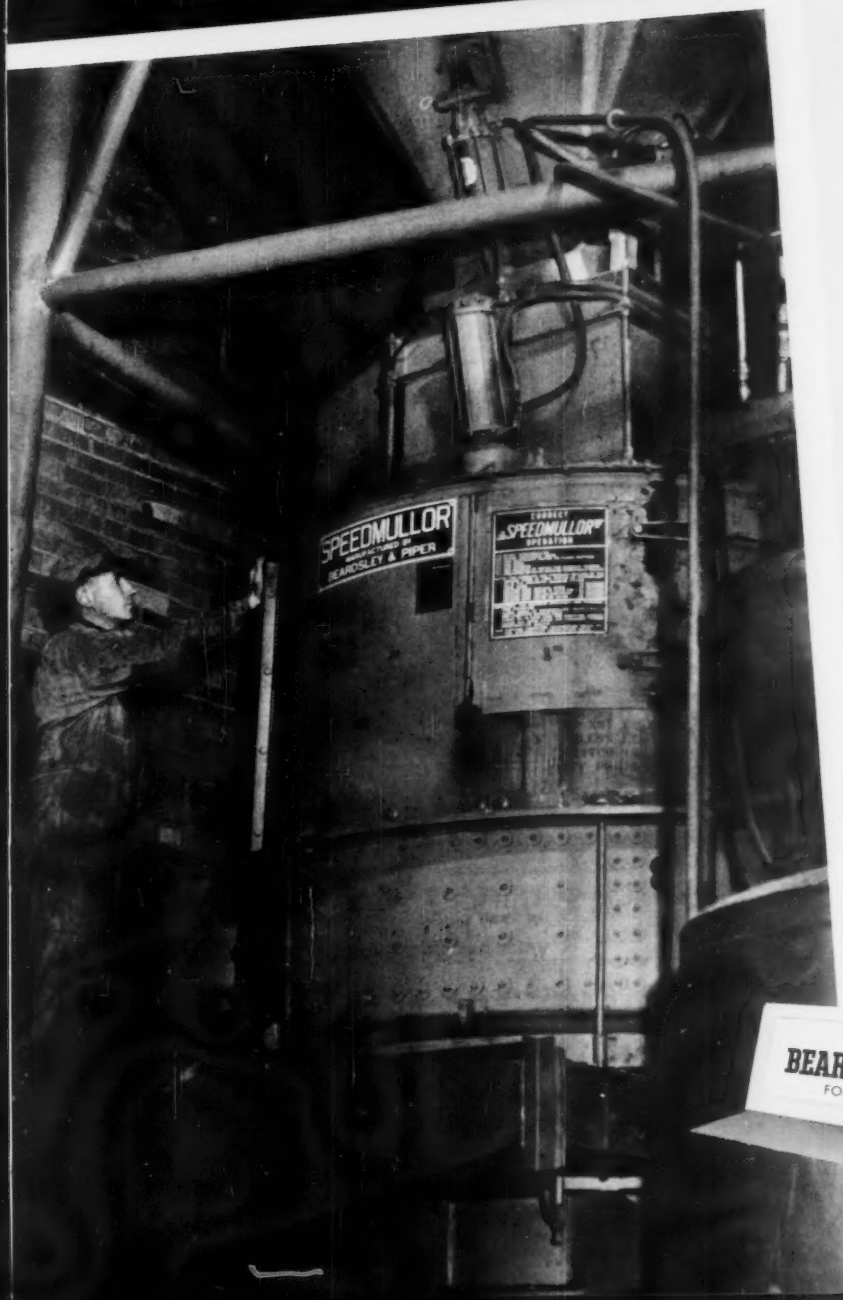
Other Associations Report

Representatives of various other foundry associations present at the meeting gave brief reports on recent developments in their respective groups. They included J. Scott Parrish Jr., president, Gray Iron Founders' Society and Richmond Foundry & Mfg. Co., Richmond, Va.; Paul L. McCulloch Jr., vice president, Alloy Casting Institute, and president, Electro-Alloys Div., American Brake Shoe Co., Elyria, Ohio; E. J. AuBuchon, president, Foundry Facings Manufacturers Association and M. A. Bell Co., St. Louis; Lowell D. Ryan, executive vice president, Malleable Founders' Society; Charles T. Sheehan, executive secretary, National Foundry Association; Edward J. Walsh, executive director, Foundry Educational Foundation; Frank G. Steinebach, secretary, National Castings Council, and editor, FOUNDRY; William W. Maloney, general manager, American Foundrymen's Society; and M. E. Nevins, vice president, Non-Ferrous Founders' Society, and president, Wisconsin Centrifugal Foundry Co., Waukesha, Wis.

Featured speaker at the closing session was Frank W. Shipley, foundry manager, Caterpillar Tractor Co., Peoria, Ill., who discussed "What the Foundry Industry Expects of the Equipment Manufacturers." Principal recommendations made were these: 1. Continuous improvements in equipment and technology which will enable foundries to attract personnel with a higher level of education. 2. Development of new tools and methods that will improve consistency of casting quality. 3. Improvement in methods to reduce material handling costs. 4. Development of improved melting techniques, cheaper and more efficient dust and smoke collecting equipment, and greater use of hydraulic power in equipment. 5. Minimizing of noise through redesign of equipment.

The 1958 meeting of the association will be held at the Greenbrier, Oct. 16-18, it was announced.

STILL ANOTHER MALLEABLE FOUNDRY GOES SPEEDMULLOR



...a batch of fluffy, flowable, cooled sand every 85 seconds

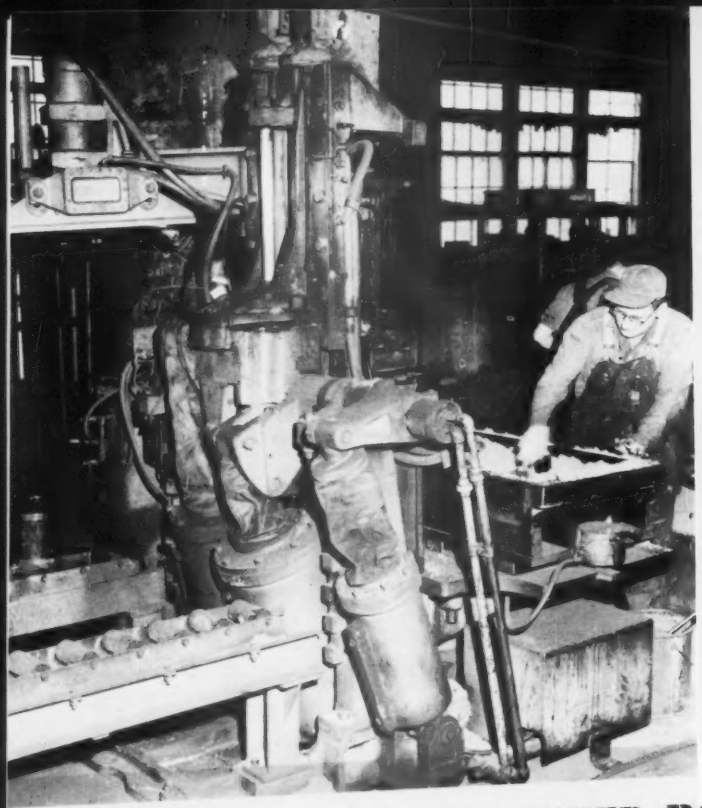
Iowa Malleable at Fairfield, Iowa, that state's only malleable jobbing foundry, has installed a new Model "70A" Speedmullor to prepare all of their synthetic molding sand. The new unit prepares from 275 to 300 tons of synthetic sand in a 6 to 7 hour day to keep 32 molders supplied. Benefits include not only higher production but improved sand quality and far better control over sand properties. The unit, equipped with Speedmullor Cooling, is an important step in this foundry's progress.

A four-screen portage sand of 67 average grain fineness is prepared in the mullor with minimum additions. The moisture is held to four per cent, and a green strength of 8 p.s.i., and permeability of 90 are obtained in a 60-second mulling and cooling cycle. Speedmullor Cooling is important because the sand is returned to the mullor directly from the shakeout at very high temperatures. A fluffy, flowable batch is discharged from the mullor every 85 seconds ready for molding. No further preparation or aeration is required with the Speedmullor. Write now for full information — Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Ave., Chicago 39, Ill.

THE WORLD'S FOREMOST DEVELOPER OF FOUNDRY MACHINERY

LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

MEMBER FEMA



NEED A JOLT ROLLOVER *with automatic clamping?*

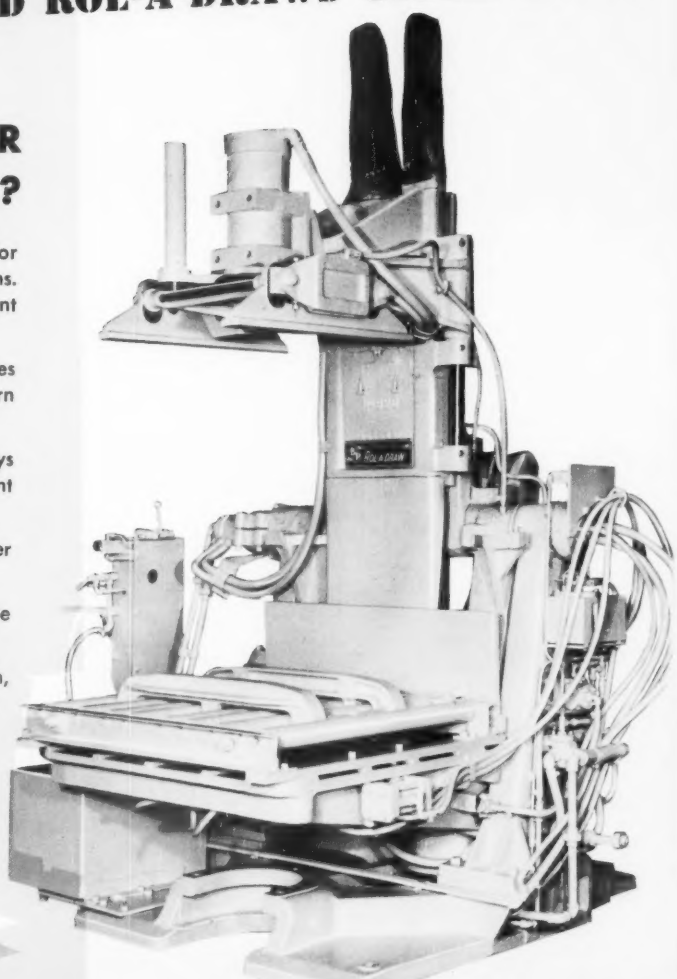
- ✔ New "T" slot table clamps . . . perfect for clamping core boxes or pattern boards on jolt rollover applications . . . top flexibility with instant adjustment to all sizes within range of machine.
- ✔ Automatic flask and core box equalizer is standard equipment . . . provides smooth, accurate draw despite core box or pattern board irregularities.
- ✔ Automatic flask height adjustment provides clamping for any height core box or flask within range of machine. Exclusive dual cylinder adjustment.
- ✔ Automatic push-button rollover cycle provides a fast, smooth, no-delay rollover everytime.
- ✔ No pits for installation . . . just one of many money-saving features.

NOW B&P FLOOR-MOUNTED ROL-A-DRAWS OFFER BOTH!

NEED A ROLLOVER *with automatic clamping?*

- ✔ Automatic, conveyor mounted clamp is ideal for multiple-station molding and coremaking installations. Provides instant clamping for a wide range of different patterns and core boxes.
- ✔ Automatic flask and core box equalizer — eliminates defective molds and cores caused by uneven pattern boards or core boxes.
- ✔ Automatic flask height adjustment — eliminates delays when many different jobs are run. Provides instant clamping of different height boxes and flasks.
- ✔ Push-button rollover cycle for a fast, smooth rollover everytime in minimum time.
- ✔ No pits for installation — an important B & P feature to make installation easier and far less costly.

Beardsley & Piper, Div. Pettibone Mulliken Corporation,
2424 North Cicero Avenue, Chicago 39, Illinois



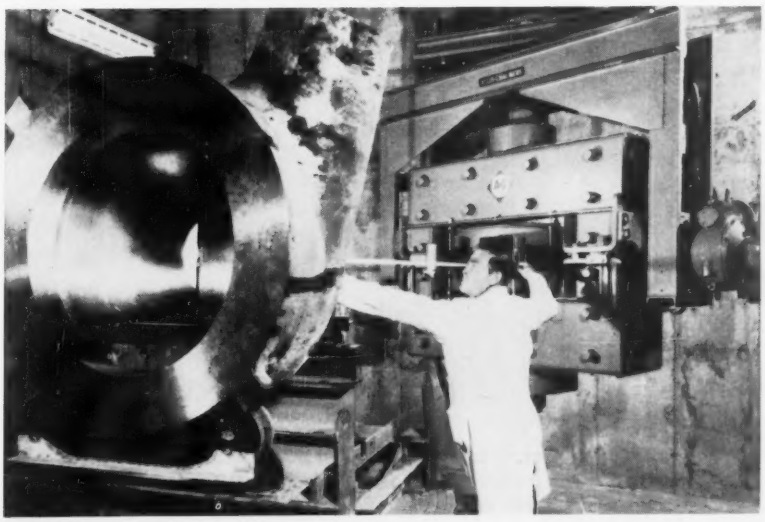
THE WORLD'S FOREMOST DEVELOPER OF FOUNDRY MACHINERY

News Views

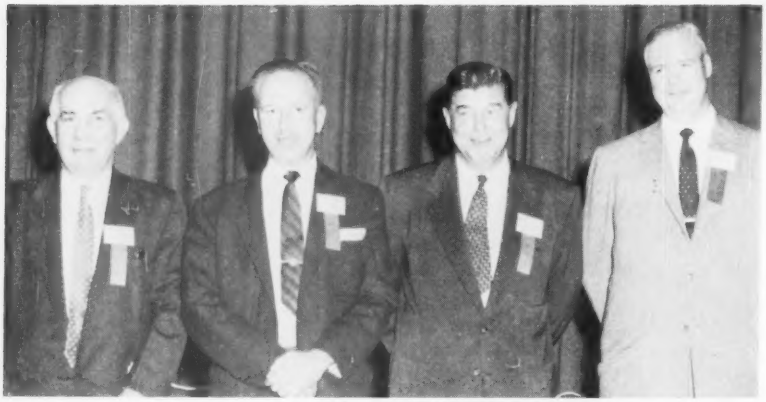
HOW TO BUY CASTINGS: Executives hear a discussion by Prof. Howard F. Taylor of MIT at the "Getting the Most for Your Casting Dollars" seminar held recently in Boston. Sponsored by Metallurgical Associates Inc., New York foundry consulting firm, sessions were attended by more than 200 purchasing agents and engineers. The clinic was the first of a series to be held in a number of cities to provide casting buyers with practical information to help them get more and better castings for their companies' money

NEW ALUMINUM FOUNDRY: Chevrolet Motor Div., General Motors Corp., Detroit, has broken ground for a new aluminum foundry at Massena, N. Y. Turning over the first spadeful of earth, on Oct. 4, is William L. Mosher Jr., second from left, regional plant manager. Watching, left to right, are Thomas S. Bushnell, mayor of Massena; Lloyd Hosmer, town supervisor; and Daniel O. Sheets, president, Massena Chamber of Commerce. The plant is due for completion in midsummer, 1959. It will employ about 700 persons and will manufacture aluminum parts

BUILDING FOR BETTER VALVES: A new $5 million brass valve manufacturing plant and engineering and research laboratory is being built at Braintree, Mass., by Walworth Co. The 300,000-sq-ft facility is to be completed in July, 1958. Working on the cornerstone are, left to right, Fred W. Belz, president, Walworth Co.; Mrs. Foster Furcolo, wife of the governor of Massachusetts; Leverett Saltonstall, U. S. senator from Massachusetts; and H. S. Payson Rowe, vice president and treasurer of John Hancock Mutual Life Insurance Co.



BIG BETATRON: A 24-million-volt betatron now in use at Electric Steel Foundry Co., Portland, Oreg., gives off x-rays at 9/10ths the speed of light and penetrates 20 in. of steel in a matter of minutes. It was purchased from Allis-Chalmers Mfg. Co., Milwaukee, and is one of seven available to U. S. industry and the only one west of the Mississippi River. Both the betatron and its controls are housed in a concrete-lined pit which is 25 x 60 x 21 ft. Castings are placed and removed by a 20-ton bridge crane



Dr. C. C. Furnas, left, chancellor, University of Buffalo, gave the welcoming address at the conference. Others, left to right, are O. J. Myers, regional vice president, AFS; L. H. Durdin, AFS national vice president, and E. J. Burke, Western New York Chapter chairman

250 Foundrymen Meet at

Niagara Frontier Conference

By **WILLIAM G. GUDE**
Managing Editor

WESTERN New York Chapter of the American Foundrymen's Society was host to the successful Niagara Frontier Regional Foundry Conference held at Hotel Statler, Buffalo, Oct. 24-25. The conference, which attracted an attendance of about 250 people, was sponsored also by the Eastern New York, Ontario, Rochester, Northwestern Pennsylvania, and Central New York Chapters of AFS.

Leonard Greenfield, Samuel Greenfield Co., Buffalo, was general chairman of the conference committee.

Fourteen technical meetings, two luncheon sessions, and a general meeting opening the conference were included on the program. Visitors to the conference were welcomed at the opening meeting by Dr. C. C. Furnas, chancellor, University of Buffalo, who discussed some of the problems and opportunities facing the country here and abroad.

L. H. Durdin, vice president, Dixie Bronze Co., Birmingham, and the AFS, spoke briefly on certain activities of the national society.

Recent and prospective trends in the foundry industry as regards number of foundries, production, and technical developments were discussed by William G. Gude, managing editor, FOUNDRY.

Speaker at the first of the two luncheons was W. H. Bleakley, sales manager, Abco Inc., Erie, Pa. Mr. Bleakley made an unusually effective plea for the adoption of a safety program that will prevent accidents to the eye. His description of what the sightless person experiences was made particularly vivid by the fact that he himself is blind.

Elmer Lux, candidate for the Buffalo mayoralty, spoke at the second luncheon on business and industrial developments in the Niagara Frontier area.

TECHNICAL PAPERS

Development of Pneumatic Sand Reclamation, by Clifford E. Wenninger, technical director, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago. Pneumatic scrubbing units will produce high-quality reclaimed sands, with AFS clay reduced to 0.5 per cent or less, at a cost of less than 75 cents per ton for operation and maintenance. Allowing $1 a ton for overhead and depreciation gives a total cost of $1.75 a ton.

Subangular base sands require almost twice as much scrubbing as round-grain base sands of like distribution analysis. Sands finer than AFS No. 65 should be considered as being akin to subangular sands because total mass surface area requires additional scrubbing during processing.

Pneumatic scrubbing units have been used successfully to reclaim shell-mold and CO_2-process sands.

Cupola Variables and Control, by W. L. Adams, district sales manager, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago. So-called mysteries of cupola operation are mainly lack of sufficiently close control of those variables which can be controlled. Some foundries have found that use of the most modern tools which are intended to improve efficiency of cupola operations still does not give them the control they seek. Actually it is not the fault of the tools, because their usefulness depends on control of the basic variables connected with cupola melting.

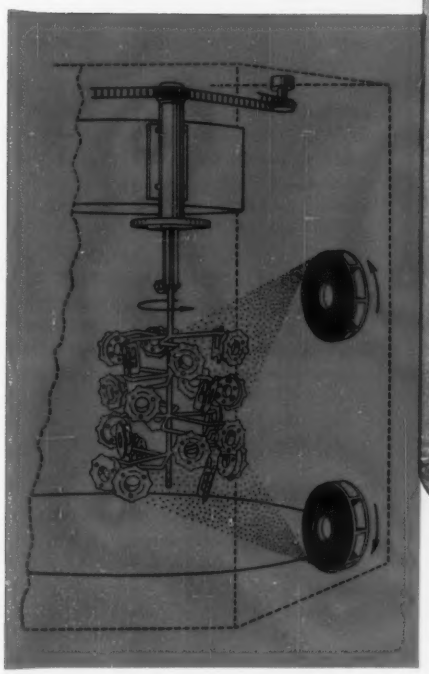
Which Core Process, by Anton Dorfmueller Jr., Archer-Daniels-Midland Co., Cleveland. Since a core's only purpose is to produce a dimensionally accurate cavity in a casting, the best core is the cheapest one

Speaker's table at luncheon session includes, left to right, M. D. Emery, executive committee; E. J. O'Connell, entertainment committee; W. H. Bleakley, Abco Inc., and Leonard Greenfield, chairman

WHEELABRATOR®

spinner hanger cabinet

. . . simple solution to special cleaning problems



Creative engineering plus the unparalleled productivity of the airless Wheelabrator brings another ingenious, cost-cutting solution to complex cleaning problems in the foundry. It's the Wheelabrator Spinner-Hanger Cabinet for cleaning a wide range of sizes, weights and shapes of castings. For instance, one of these Cabinets at Benton Harbor Malleable Industries, Inc., is cleaning several hundred different sizes of castings, weighing up to 150 lbs., that would have required at least two different types of machines. The work-carrying hanger, illustrated at left, holds 2 to 12 castings and rotates in several compartments to obtain thorough cleaning. This new design offers tremendous possibilities for savings in jobbing and production foundries alike.

Write today for information on how a Spinner-Hanger Cabinet or other Wheelabrator machine designs can answer your problem of rising operating costs.

WHEELABRATOR CORPORATION

505 South Byrkit Street Mishawaka, Indiana

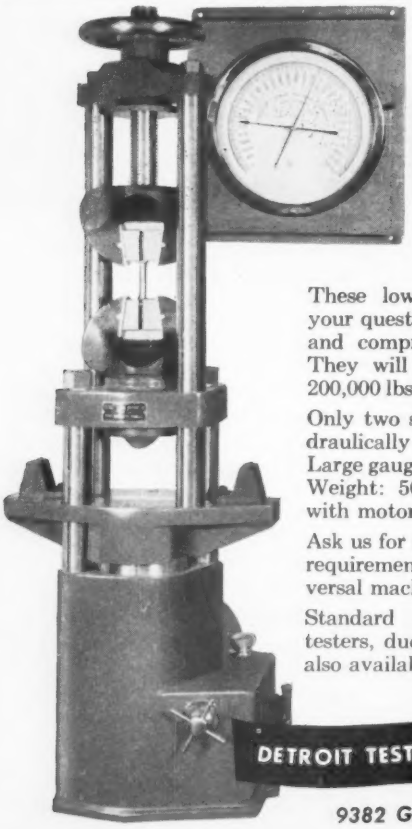
WORLD'S LARGEST MANUFACTURER OF AIRLESS BLAST CLEANING EQUIPMENT

CARB-RITE
IN THE METALLIC MIX

CARB-RITE, properly sized for charge carbon and used as a substitute for pig iron in the metallic mix of open hearth, air furnace, and cupola charges, yields approximately 85% efficiency of the contained carbon in the acid process, and approximately 70% in the basic process. CARB-RITE definitely does not produce a heavy, mucky slag condition which reflects heat to the furnace lining, causing same to sweat badly during the refining period. When CARB-RITE is used, the silicon in the charge can be pegged at any point found to be advantageous to the operation of the furnace, consequently, considerable less fluxing in the basic process is necessary, affording a better heat transfer to the charge, due to the greater slag fluidity.

CARB-RITE
COMPANY
1815 HALSTED ST.
CHICAGO HEIGHTS, ILL.

Circle 664 on Page 51



30,000 and 40,000 pound
Universal
Testing Machines

These low-cost machines will answer all your questions about the tensile, transverse, and compression strength of metal parts. They will apply up to the equivalent of 200,000 lbs. per sq. inch (on a .505 specimen).

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Standard and special Brinnel hardness testers, ductility testers, and tensile testers also available.

DETROIT TESTING MACHINE COMPANY
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Circle 665 on Page 51

that does the job efficiently. The foundryman should consider the advantages and disadvantages of cores made by each of the four major coremaking processes—oil or resin-bonded baked core, resin-bonded shell core, gas-setting core, and air-setting core—in selecting the one best adapted to his castings. For a complete discussion of this subject, see FOUNDRY, May, 1957, p. 180.

Metal-Mold Reaction in Bronze Alloys, by R. B. Fischer, Ingersoll-Rand Co., Phillipsburg, N. J. Extensive investigation established that metal-mold reaction is a source of pinhole porosity in 85-5-5-5 composition alloy and composition "M" bronze poured into oil-bonded, dry sand molds. The porosity is the type usually visible only after machining away the surface of the casting.

Metal composition is an important factor, certain alloys being more reactive than others. Binders also are a factor. Pitch as a dry sand mold binder or as an additive to green synthetic sand eliminates pinholing of ounce metal and is being used on certain production castings for this purpose. CO_2-processed and cement-bonded molds appear to be less reactive than oil-bonded molds.

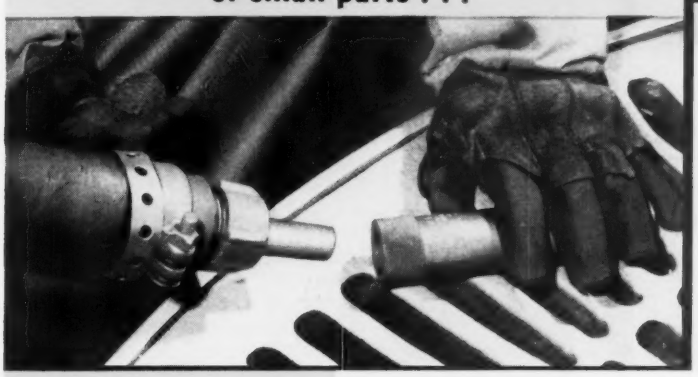
Specially developed coatings are effective in reducing pinholing, and although they generally produce relatively rough casting surfaces, one coating is being used in production effectively on selected areas of the mold and cores.

New Metals in the Foundry, by J. D. Allen, Federated Metals Div., American Smelting & Refining Co., Newark, N. J. Application of low-melting-point metals to castings is increasing. Atomic energy work, for instance, is requiring a growing number of lead castings, some weighing as much as several tons. In casting lead or zinc in sand, 00 Albany sand is recommended, using round risers and a square sprue. Good venting is necessary. Gating problems are similar to those with other types of nonferrous castings. A crucible rather than an iron pot should be used in melting zinc.

Gas and Its Control in Aluminum Castings, by D. L. LaVelle, Kaiser Aluminum & Chemical Sales Inc., Chicago. Hydrogen in aluminum originates from the reaction of molten metal with water or water vapor. It results in gas porosity or pinholes in the castings. Solubility increases rapidly with increasing temperature, and overheating and holding at elevated temperatures are prime causes of excessive porosity. Hydrogen can be removed by bubbling nitrogen or chlorine through the melt, by plung-

BLAST!

or small parts . . .



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QUAKER RUBBER DIVISION

ing in tablets of chlorinated hydrocarbons, or by vacuum degassing. Presence of a small amount of gas in aluminum is not detrimental, because completely degassed metal shows aggravated shrinkage.

Engineering Characteristics of Steel Castings, by Clyde B. Jenni, chief metallurgist, General Steel Castings Corp., Eddystone, Pa. Foundrymen should advise designers as to the most efficient use of metal in the latters' products. While a combination of maximum strength and minimum weight is the ultimate goal, knowledge of where stresses are concentrated is a prerequisite. Proper design not only can eliminate residual stresses but also gives improved appearance and sales appeal. Steel castings provide a wide range of mechanical properties, and they have a uniform structure free from flow lines, good weldability, favorable fatigue properties, and dimensional stability.

Russian Foundry Industry, by A. J. Kiesler, General Electric Co., Schenectady, N. Y. Russia keeps up to date on technical information from other countries and is well advanced on foundry practice. The large majority of cores used are hardened by the CO_2 process. Engineers and technicians are given preferential treatment in both training and wages.

Core and Molding Sand Additions, by J. A. Gitzen, president, Delta Oil Products Co., Milwaukee. The trend in development of sand additives has been toward the use of less water, because excessive moisture causes trouble in both molding and coremaking. Seacoal was one of the early additives adopted by gray iron and malleable foundries. Steel foundries use clay additives. Core oils first became popular in the early 1920s. Use of bentonite in steel foundries started about 1915 and gave the advantage of strength with less water. Southern bentonite came into prominence about 1920.

Wood pitch was an early sand additive which later was supplanted by coal tar pitch. Asphalt pitch does not pulverize easily and is relatively expensive. Corn flour additives have proved superior to rye or wheat from the standpoints of surface finish, collapsibility and hot strength. Another additive with an early history is calcium lignin derived from paper mill sulfide byproducts. Iron oxide came into use in 1939 as a core additive to stop veining. Wood flour use originally started about 1923 but became more general after 1940. Synthetic resins were introduced about 1940 and have been given added impetus by shell molding. Sodium silicate,

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WHEELABRATOR® STEEL SHOT

cuts abrasive costs for

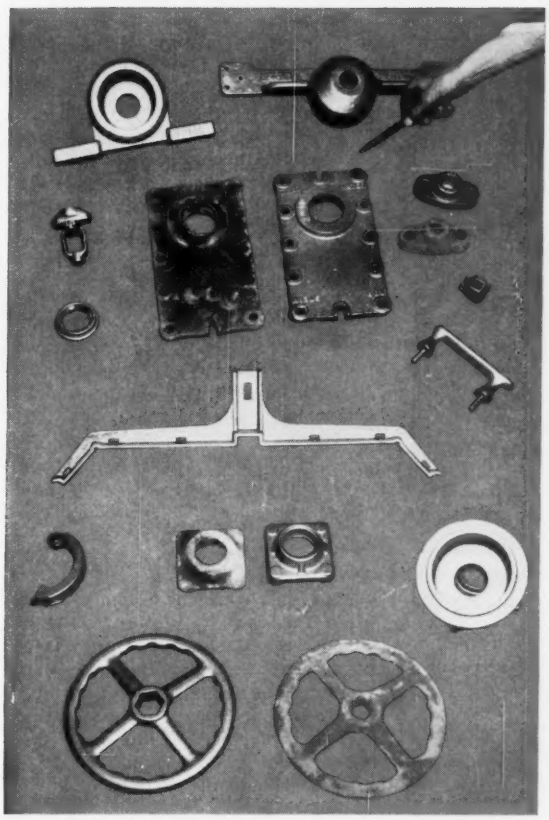
ALL TYPES

of foundries

GRAY IRON FOUNDRY

reduces abrasive consumption

75%



Castings shown here before and after cleaning illustrate the thorough cleaning accomplished with Wheelabrator Steel Shot.

Cleaning an average of 13 tons of gray iron castings a day, the Plainville Castings Co., Westfield, Mass., used to consume 100 lbs. of chilled iron shot every day and 200 lbs. of malleable iron shot every week.

On the basis of a 4-week month this adds up to a total of 2,800 lbs. of abrasive per month. With Wheelabrator Steel Shot, the heat treated electric furnace steel shot, the same amount of cleaning is accomplished with only 400 to 500 lbs. per month.

Besides achieving these outstanding reductions in shot consumption and shot costs, Wheelabrator Steel Shot also provides "a beautiful finish, in comparison to the other abrasives," according to Joe Stopski, Foundry Superintendent. "We also find that our maintenance costs are lowered" the superintendent adds.

Wheelabrator Steel Shot is bringing savings in abrasive consumption, abrasive costs maintenance expense and parts replacement to all types and sizes of foundries. Why don't you let this versatile shot save for you, too?

Write today for your free copy of Bulletin 89-B for more information on Wheelabrator Steel Shot.

WHEELABRATOR

CORPORATION

505 South Byrkit Street Mishawaka, Indiana

Circle 668 on Page 51

used with carbon dioxide, was employed years ago in the production of strainer cores.

Fundamentals of Sand Control, by Earl E. Woodliff, Foundry Sand Engineering Co., Detroit. Control essentially is a matter of exercising good sense, but the one responsible for it must be familiar with the effect of mechanical processing on the sand's behavior. Many casting defects result from sand expansion, and it is necessary to provide the proper bond and possibly certain additives to act as a cushion between grains. While we have only begun to scratch the surface in the science of sand use, the tendency to follow accepted practices often retards new developments.

Production Problems in Casting Stainless Steel, by Ernest A. Schoefer, executive vice president, Alloy Casting Institute. Because high-alloy castings frequently are designed for a given application and must have a highly specific combination of physical and mechanical properties, close control of foundry operations in their production is necessary. The need for producing a large number of different closely controlled alloys in small batches is probably the biggest problem for the melting department. Control of scrap segregation and selection of purchased scrap also pose problems. Recovery of alloy elements from virgin additions and from revert scrap is another melting difficulty.

Certain inherent characteristics of high alloys, such as variations in shrinkage and fluidity, create problems in the molding department. Cleaning and heat treatment likewise require care and close control.

Melting Stainless Steel, by Lou Coshdollar, Cleveland district manager, Pittsburgh Metallurgical Co., Niagara Falls, N. Y. Most charges are made up of revert scrap, with ferrochrome and basic scrap essentially making up the balance of a straight chrome charge. In chrome-nickel grades, nickel and other elements with low affinity for oxygen are generally charged also. Lime is usually added in amounts ranging up to 5 per cent or more of the charge weight. Silicon in some form is usually added to around 1.5 per cent of the charge weight.

Gaseous oxygen generally is introduced into the bath, the time of introduction varying with different shops. Next is the deoxidizing of the slag and bath, usually with low-carbon ferrochrome silicon, plus an addition of burnt lime. Chromium and manganese also are added to bring the bath to finished specifications and speed up the heat. In some cases silicon also is added. The slag next is removed, the bath stirred, and the alloy test taken. Subsequently only good slag practice is necessary, with slag chemistry dependent on the grade being made and ambient atmosphere. In periods of high humidity it is not always possible to use what may be generally considered best slag control.

Latest Developments in the Pattern Industry, by Walter H. Siebert, Cleveland Standard Pattern Works, Cleveland. Skill required in pattern-making has defied attempts to automate the industry or to use anything but skilled labor. At the same time, automation has created a demand for large machine castings of a complicated nature. Patterns for these castings must be planned from the foundry's, not the patternmaker's, standpoint, necessitating close cooperation between the two. Nevertheless, both parties must seek ways of cutting costs by learning from the user how the casting is to be used and where changes are permissible.

The patternmaker's problem is to

WITCO STAYRITE® #26

the new lubricant and release agent for shell molds and cores

Improve coatings, reduce batch time, cut power consumption, SLASH COSTS with Witco's new Stayrite #26. No-clogging, no-lumping Stayrite #26 promotes free-flowing resin-coated sand. Eliminates reagglomeration tendencies, produces uniform non-segregating coatings.

As internal release agent, eliminates sticking, risk of shell damage in pattern stripping. Ideal for both automatic air-blowing and dump-box methods. Strongly suggest write for details today.

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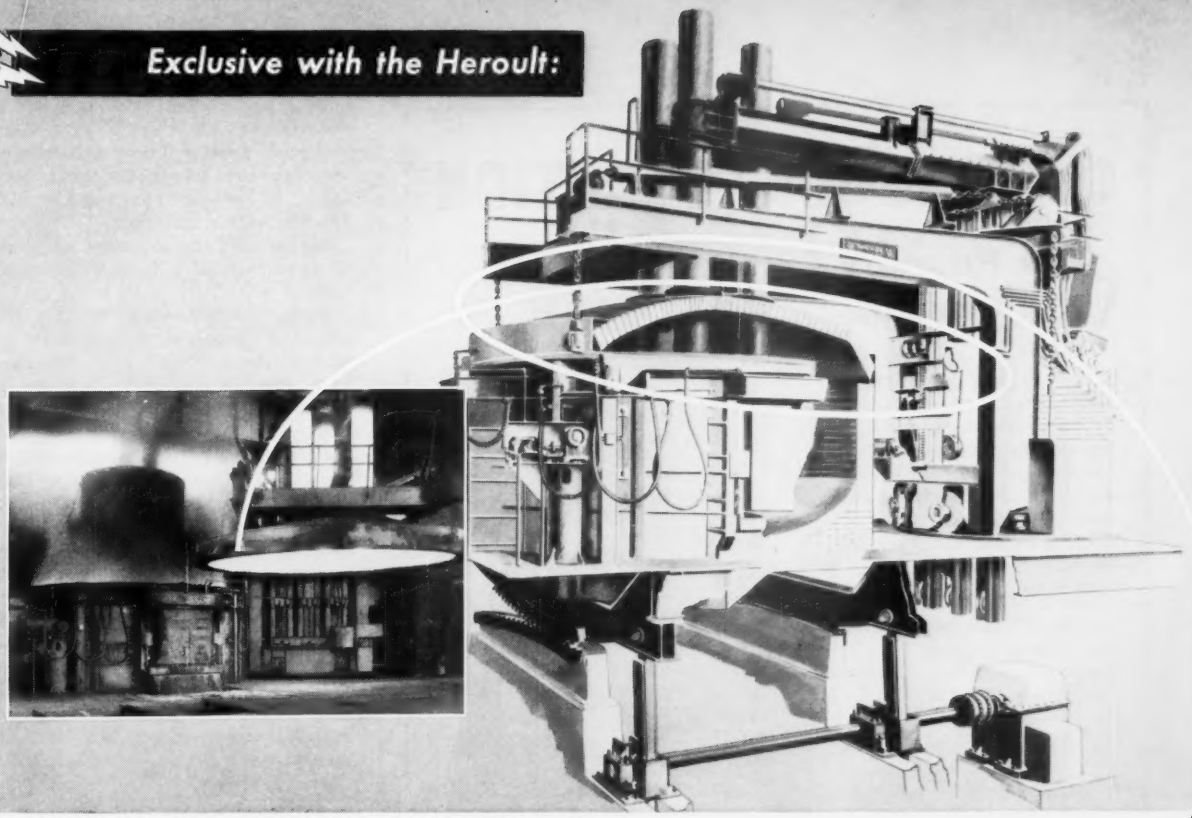
Circle 670 on Page 51→

Exclusive with the Heroult:



Water-cooled Skew Back Roof Ring

One of the features of the new Heroult is its low-cost maintenance. It is designed to make bricking easy and economical. Even the repair of the removable roof can be accomplished in much less time and with less labor and material cost. For the Heroult is the only electric furnace on the market with a water-cooled skew-back type of roof ring. This patented design feature eliminates the need of special skew-shaped brick.

Embodying the latest in mechanical and electrical equipment, these widely used furnaces are noted for efficient performance and low operating and maintenance costs.

They are available in size of shell diameter ranging from 7′0″ up to 24′6″, and with rated charge capacity of from 8000 lbs. up to 400,000 lbs. They are equipped with removable roofs to permit top charging. Both gantry and swing-type roof-removing mechanisms are available. Door-charging furnaces and furnaces of special design, including units equipped with non-magnetic steel bottoms to permit induction stirring, can be supplied.

We welcome an opportunity to help you select and install the Heroult best suited to your needs.

The Heroult is the only 100% mechanically operated electric furnace

All of the movements of the Heroult are handled by motor-driven gear mechanism. This is a very important advantage, for it eliminates many maintenance difficulties. Your own maintenance man can easily keep this modern electric furnace performing efficiently with a minimum of service.

This and other Heroult exclusives, such as cage-type shell construction, independently supported operating mechanism, and water-cooled skew-back roof ring, make the Heroult the finest electric melting furnace on the market.

Ask for latest catalogue

This free catalogue will help you determine how Heroult Electric Furnaces can improve your operation . . . and enable you to make better quality steels. Tells you where and when an electric furnace is desirable. Gives furnace types, sizes, capacities and ratings. For your free copy, just contact the office nearest you, or write direct to Pittsburgh.

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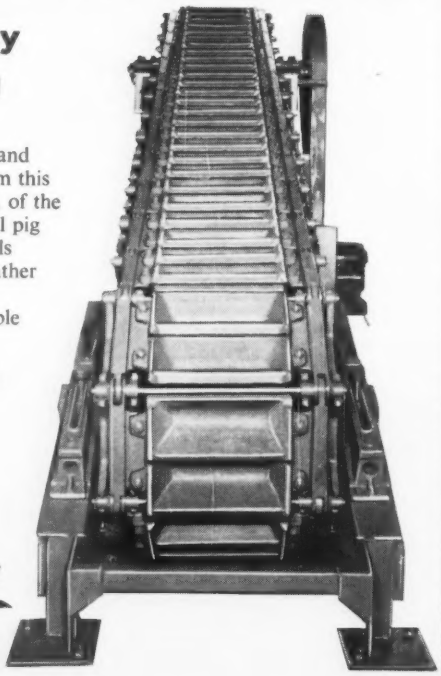
For Foundry Pig Casting

Sharply reduced down-time and maintenance costs result from this design which eliminates 80% of the moving parts of conventional pig casting machines. Idler wheels are mounted on the frame rather than on the moulds, thus keeping them as far as possible from the hot metal.

Bailey Pig Casting Machines are made in capacities from 3 to 50 tons per hour. Sizes: 15 to 125 feet, in multiples of 5 feet.



Bailey

PIG CASTING MACHINES

WILLIAM M. Bailey COMPANY
ENGINEERS
LEADERSHIP THROUGH QUALITY

1221 BANKSVILLE ROAD PITTSBURGH 16, PA

build a pattern that will stand up in service and still make it at a competitive price. This necessitates teaching the apprentice the importance of proper construction and handling of his materials.

Mr. Siebert also described all steps of production of a hypothetical pattern.

Pattern Engineering, by Ray Olson, vice president, Southern Precision Pattern Works Inc., Birmingham. Pattern materials, methods of processing, and end uses are so widely diversified today that a new identity, the pattern engineer, has developed. Close co-operation between tool engineers or machine shop supervision and pattern engineers can save considerable grief and money, but pattern engineers must be familiar with every piece of molding and coremaking equipment in the foundry. With the current and prospective shortage of engineers, young men in industry who are unable to go to college offer fine raw material for development, through adequate training programs, into skilled pattern and foundry engineers.

What's New with Lithium

To meet the growing demand for information on lithium and its compounds, the American Lithium Institute, 32 Nassau St., Box 594, Princeton, N. J., is offering a monthly newsletter, **What's New with Lithium.** It includes a review of new developments in the field and a summary of current articles appearing in trade and business publications. On request, the newsletter will be mailed to management, technical, and production people in industries where lithium has found application or might be applied.

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an announcement of interest to design engineers

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Circle 672 on Page 51

SIPAC T.M. NON-CARBONACEOUS CORE COATING THAT PRODUCES SMOOTHER FINISHED CASTINGS

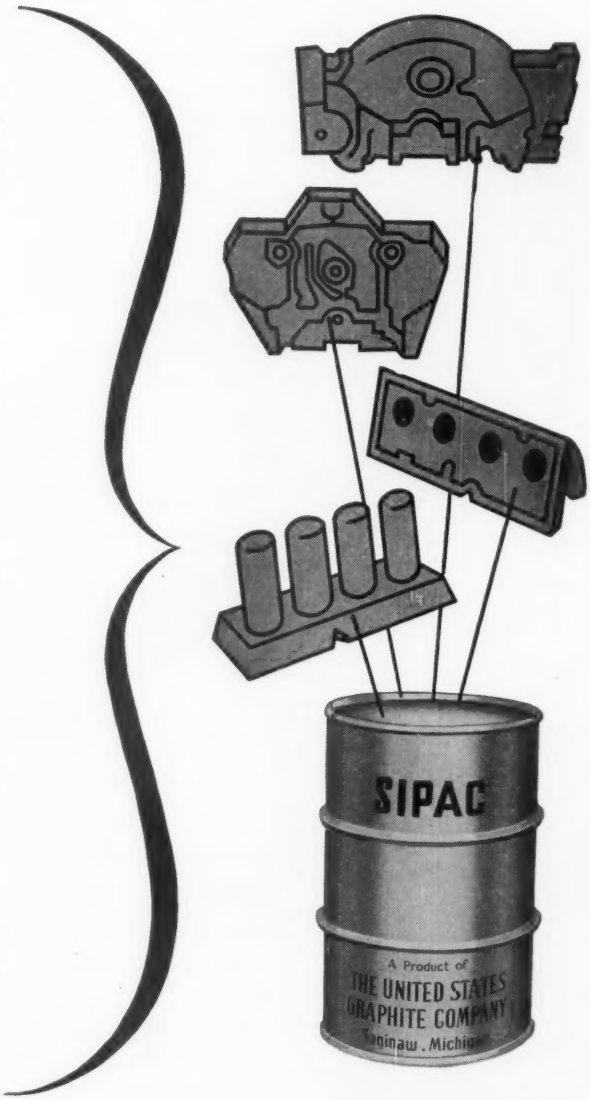
SIPAC United States Graphite Company's complete core coating, requires only the addition of water, and produces bright, gold-colored coating with fine, smooth surfaces—using any foundry sand.

SIPAC is non-carbonaceous and inert; will not react with any molten metal, including grey iron and steel. Clean to handle, its burnished gold color makes cores highly visible—a real help in placement of cores in the mold.

SIPAC costs less and gives improved casting quality. Resists flaking and completely seals core surfaces.

AVAILABLE in 55-gallon drums, (in paste form) ready for mixing and dilution to your desired Baume—even to a scale of 32—without settling.

WRITE TODAY for details about SIPAC or any other United States Graphite Company core and mold coatings.



228

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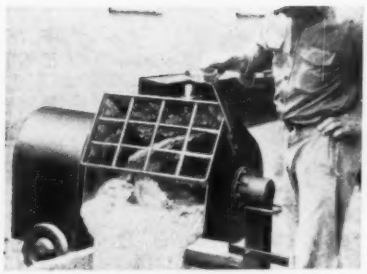
Circle 673 on Page 51

FOUNDRY EQUIPMENT AND SUPPLIES DIGEST

For More Details on These Items Use Reply Card —Page 182



CORE SAND MIXER

Supermix core sand mixer for CO_2 process reportedly works equally well with all core binders. Its figure-eight blending action is said to cut mixing time in half, speed production, and reduce air hardening. A close-fitting hinged cover is optional in place of the safety grill. Manufacturer claims that the stirring action of the mixer does not heat, crush, or ball the sand. Mixing drum and paddle shaft bearings are liquid and sand-tight to permit thorough cleaning while under power (various binders can be mixed in the same machine without contamination). Mixers can be furnished as portable machines or as permanent installations in a variety of capacities. Made by **United States Forge & Foundry Co.**, Pulaski, N. Y.

For More Details Circle No. 401—Page 182

GAS-FIRED SALAMANDERS

Gas-fired salamanders are available in two sizes—a regular size and a giant size with double capacity. Heaters can provide a primary heat source or a supplementary source for heating localized areas. They operate on natural, manufactured, or mixed gases. Safety features include a protective wire guard and an automatic shutoff valve that stops gas flow when it drops below operating pressure. Made by **Summit Products Co.**, Uniontown, Pa.

For More Details Circle No. 402—Page 182

MOLD LUBRICANT

Water-graphite die lubricant for permanent molds is a concentrate of jelly-like consistency which is transformed into a free-flowing lubricant when water is added. The action of water being poured usually produces sufficient agitation to provide a lubricant ready for use without additional mixing or stirring. It contains no ammonia or other corrosive ingredients. For permanent molds, two basic coatings are recommended, one a chill coating and the other a refractory coating. Application of the Graphite Suspension No. 74 may be made by spraying, brushing, or dipping. Made by **Joseph Dixon Crucible Co.**, Jersey City 3, N. J.

For More Details Circle No. 403—Page 182

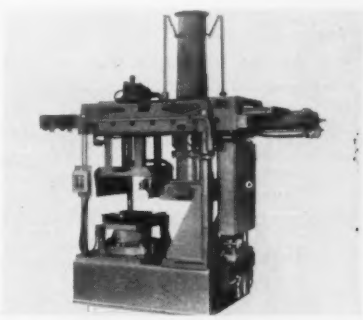
SHELL MOLD RELEASE

Shell mold release agent is capable of withstanding temperatures above 1000° F and when sprayed or brushed on hot patterns or coreboxes it bonds itself to the metal and leaves a thin impervious film. Resins reportedly will not wet or unite with its dry surface thus preventing carbonaceous crust buildup. The coating is said to be a heat conductor rather than an insulator and promotes a fast, uniform curing of the skin surface of the shell or core. According to the manufacturer, users report yields of 50 to 125 cycles per spray application, including shell coreblowing operations. Made by **Chem-Cote Co.**, 5644 South Christiana Ave., Chicago 29, Ill.

For More Details Circle No. 404—Page 182

MOLDING MACHINE

Blow-squeeze-strip molding machine requires only that the operator load the empty flask into the machine. A predetermined volume of sand is blown into a preformed cavity and squeezed into the flask. The pattern is then stripped from the mold. Operating on a preset time cycle, the operation provides quality control of mold density and casting finish. An added advantage is said to be a negligible amount of sand spillage. Made by **Osborn Mfg. Co.**, Machine Division, 5401 Hamilton Ave., Cleveland 14, Ohio.



For More Details Circle No. 405—Page 182

TOWING TRACTORS

Towing tractor Models T-50 and T-60 develop 5000 and 6000 lb drawbar pull, respectively. Both are two-wheel-drive machines. The Paymover units are compact, maneuverable, and feature torque converter drives

and automatic transmissions. A wide variety of coupler attachments is available. Made by **Frank G. Hough Co.**, 703 Seventh Ave., Libertyville, Ill.

For More Details Circle No. 406—Page 182

PNEUMATIC GRINDERS

Series 1500 pneumatic hand grinders are designed for a variety of metal grinding, sanding, and wire brushing operations. Use of magnesium castings in the construction has minimized weight. Lever type, thumb tip throttle provides control of tool without changing grip. A special muffler handle reduces noise and serves as an air exhaust. The basic tool is made in a variety of speeds and for several different wheel and guard mountings to meet virtually any requirement. Made by **Cleco Air Tool Division, Reed Roller Bit Co.**, 5125 Clinton Dr., Houston 20, Tex.

For More Details Circle No. 407—Page 182

CONVEYOR LUBRICATOR

Air-operated lubricator for oiling chain pin links on trolley type conveyors is fully automatic and uses any grade of oil. Lubricator is driven by the conveyor chain which actuates a group of oil-dispensing nozzles moving in and out over the conveyor chain as well as along with it, without interference with the trolley brackets. When nozzles are positioned properly over the chain pins, a metered amount of oil is dispensed on top of each pin. The oil is solid, not a spray. Stoppage of the conveyor in any position cannot cause continuous delivery of oil. Lubricators are available for 3, 4 or 6 in. pitch chains. Made by **Moore Lubricator Co.**, 121 North 120th St., Milwaukee 13, Wis.

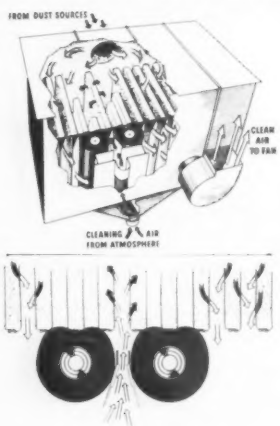
For More Details Circle No. 408—Page 182

VACUUM MELTING FURNACE

Vacuum induction melting furnace of 50 to 300 lb capacity features an 8-ft-long, 5-ft-diam chamber, a 2900-liter-per-second diffusion ejector pump, a 310-cfm mechanical pump, and a control center. Two observation windows, a bridge breaker, and a sight tube are standard equipment. A 36-in-diam mold well facilitates pouring of large-diameter molds as well as adding an accessory mold table. Standard well accommodates molds 48 in. high. Mold table permits 42-in. molds. Crucible is tilted by an air-power unit controlled remotely from the side of the chamber. Tilting speed is variable in either direction and the crucible is held in any position by a braking system. Made by **Consolidated Electrodynamics Corp.**, Rochester Division, 1775 Mt. Read Blvd., Rochester 3, N. Y.

For More Details Circle No. 409—Page 182

Portable Dust Filter Features Roller Cleaner



DYNACLONE DUST FILTER provides an efficient method of cleaning collected dust from filter bags. A roller cleaner moves back and forth across the open ends of the filter bag, sealing each bag as it is being cleaned by atmospheric air. The cleaning air is brought into the filter by the main operating fan while the filter continues to operate. The Dynaclone provides constant suction at dust sources and is designed for applications where the process ventilated is continuous and the dust volume and concentration are high.

Rolls are made of wear-resistant gum rubber combined with an inner filling of sponge rubber to provide maximum resiliency as the rolls travel over the dust wall. An aluminum center core causes the rolls to press into the dust wall to provide a complete seal at every point. Claimed advantages are increased cloth area (more than in original models) to provide greater filtering capacity, easier filter bag changing, complete dust seal, and easy access for inspection and servicing. Made by **W. W. Sly Mfg. Co.**, 4753 Train Ave., Cleveland 1, Ohio.

For More Details Circle No. 465—Page 182

LITERATURE

Resin Extender

Bulletin 111 describes Indulin, an extender for phenolic and furan resins that reportedly imparts desirable properties and effects production savings in a variety of applications, including foundry cores and shell molds.—**West Virginia Pulp & Paper Co.**, Polychemicals Division, Charleston A, S. C.

For More Details Circle No. 410—Page 182

Shipping Containers

Bulletin contains information on assembly, capacities, and specifications of nestable, selfpalletizing, steel shipping containers for inter and intraplant service.—**Ackermann Mfg. Co.**, subsidiary of Wheeling Steel Corp., Wheeling, W. Va.

For More Details Circle No. 411—Page 182

Hoist Control

General information, performance curves, and operating advantages of Dual Torque hoist control applicable to gantry and bridge cranes is provided in bulletin.—**Pacific Coast Engineering Co.**, Drawer E, Alameda, Calif.

For More Details Circle No. 412—Page 182

Blast Cleaning Machines

Photographs, application data, specifications, operating techniques, and selection guide for hand-operated blast cleaning machines are covered in Bulletin 100C.—**Pangborn Corp.**, 1400 Pangborn Blvd., Hagerstown, Md.

For More Details Circle No. 413—Page 182

Pattern Letters

Catalog 957 illustrates and describes a wide variety of cast metal letters for patterns, tablets, trademarks, monograms, product identification, x-rays, signs, or similar applications.—**Canton Products**, Box 981, Canton 1, Ohio.

For More Details Circle No. 414—Page 182

Shell Molding

"Silicate P's & Q's" for October discusses a new development in shell molding and reviews a study announced recently by Watertown Arsenal.—**Philadelphia Quartz Co.**, 1156 Public Ledger Bldg., Philadelphia 6, Pa.

For More Details Circle No. 415—Page 182

Conveying Systems

"A-F' Engineered Apron Conveying Systems" bulletin describes applications of this type of conveyor and factors to be considered

For Foundrymen

in selecting an apron, or slat conveying system. — **Alvey-Ferguson Co.**, 2229 Disney St., Cincinnati 9, Ohio.

For More Details Circle No. 416—Page 182

Brass Hose Fittings

Features, sizes, part numbers, and weights of brass hose fittings for low and medium pressure air, spray, steam, suction, water, and welding applications are offered in Bulletin 140. — **Hose Accessories Co., Le-Hi Division**, 2704 North 17th St., Philadelphia 32, Pa.

For More Details Circle No. 417—Page 182

Bonding Mortars

Seven types of high temperature refractory bonding mortars are described in Bulletin 852.—**Denver Fire Clay Co.**, 5301 Blake St., Denver 5, Colo.

For More Details Circle No. 418—Page 182

Direct-Driven Fans

LS type direct-driven airfoil axial flow fans for low static pressure ranges are illustrated and described in Bulletin 775.—**Aerovent Fan Co.**, Piqua 27, Ohio.

For More Details Circle No. 419—Page 182

Grinding Wheels

Specifications on cylindrical grinding wheels are coupled with practical grinding hints and tips in bulletin. — **Simonds Worden White Co.**, 1101 Negley Pl., Dayton 7, Ohio.

For More Details Circle No. 420—Page 182

Tumbling Abrasive

Form ESA-236 describes Borolon (aluminum oxide abrasive in chips and screened grain sizes) tumbling abrasive for barrel finishing. — **Simonds Abrasive Co.**, Tacony & Fraley Sts., Philadelphia 37, Pa.

For More Details Circle No. 421—Page 182

Core Ovens

Specifications and performance information on 14 standard models of Coleman dielectric core ovens are found in Bulletin 657.—**Foundry Equipment Co.**, 1831 Columbus Rd., Cleveland 13, Ohio.

For More Details Circle No. 422—Page 182

Bridge Ramps

Bulletin 310-3 presents engineering data on extra heavy duty, all-welded bridge ramps for double door box cars. — **Roll-Rite Corp.**, 801 Jefferson St., Oakland 7, Calif.

For More Details Circle No. 423—Page 182

FLOWMETERS

Dual range flowmeters are designed for inert-gas welding, flushing molten metals, laboratory service, and other applications where accurate control and constant visual check of flow rate are desired. The series includes seven direct reading flowmeters, each for a specific gas, and one general purpose flowmeter, provided with calibration curves, which will meter any of five gases. The meters can be attached to cylinder or pipeline regulators, directly to pipelines, or bench or wall mounted by a special clamp. Made by **Air Reduction Sales Co.**, a division of Air Reduction Co., 150 East 42nd St., New York 17, N. Y.

For More Details Circle No. 424—Page 182

AIR CONTROL DEVICE

Three-in-one combination unit for compressed air operations regulates to desired pressures, filters water and dirt from the air line, and lubricates the air stream with a fine foglike, oil mist. It is shipped ready to install and requires two connections. Unit is available in ¼, ⅜, ½, and ¾-in. pipe sizes. Made by **Perfecting Service Co.**, 332 Atando Ave., Charlotte 6, N. C.

For More Details Circle No. 425—Page 182

WIRE ROPE

SignalKore wire rope can be used to transmit continuous communication instructions through its center core as well as transmit force for hoisting and other material handling operations. The wire can be used with standard phones or sound-powered phones. Applications are said to be limited only by user ingenuity. Eleven rope diameters in sizes of ¾, ⅞, 1, 1⅛, 1¼, 1⅜, 1½, 1⅝, 1¾, 1⅞, and 2 in. are available. Made by **Wire Rope Division, American Chain & Cable Co.**, Wilkes-Barre, Pa.

For More Details Circle No. 426—Page 182

FLOOR MATERIAL

Monolithic floor surfacing material is formed in place and bonds to cement or other surfaces with a strength of 585 psi (concrete has a bonding strength of 15 psi). Half-inch applications are recommended by manufacturer to eliminate need for cutting out old floors. Ingredients can be mixed in conventional cement or plaster mixers and any surface attainable with concrete can be obtained by troweling without impairing the nonslip qualities of the materials, according to the manufacturer. Made by **Master Mechanics Co.**, 2097 Columbus Rd., Cleveland, Ohio.

For More Details Circle No. 427—Page 182

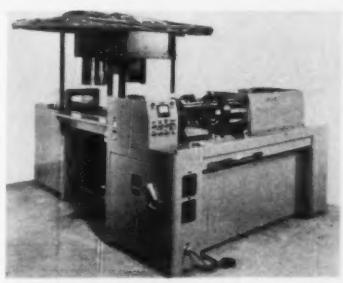
BUCKET ELEVATOR

Bucket elevator incorporates a vertical slide in its boot section to minimize overloading, jamming, and plugging. An adjustable slide plate controls the angle of repose of the sand in the boot and determines the amount of material picked up by the buckets. Other design features are a heat-resistant belt, roller bearing pillow blocks mounted away from the case in dusttight enclosures, easily removed bonnet sections, bolted

Unit Speeds Automatic Inspection Procedures

INSPECTION UNIT is designed to provide increased automatic production inspection for a wide variety of small steel and iron parts. Stainless steel tanks permit use of water-suspendible fluorescent Magnaglo materials. Magnetization may be both circular and longitudinal, simultaneous or separate, for the detection of both longitudinal and transverse defects. It permits addition of a conveyorized inspection unit to further speed the inspection operation and provide automatic demagnetization.

Two new Magnaglo fluorescent magnetic powders, No. 14 oil suspendible and No. 20 water suspendible, have been added to existing Magnaglo powders and pastes to enable users to choose a material suited to the sensitivity requirements of their particular test. The new powders also permit high-speed inspection at rates up to several thousand parts per hour. Made by **Magnaflux Corp.**, 7300 West Lawrence Ave., Chicago 31, Ill.



For More Details Circle No. 466—Page 182

construction, stationary boot bearings, and automatic control of feeds. Three bucket sizes are available—3 x 3, 6 x 4, and 8 x 5 in. Maximum discharge heights are 35, 60, and 80 ft., respectively. Capacities range up to 82,800 lb per hr of material weighing 150 lb cu ft. Made by **Carpco Mfg. Inc.**, Box 3272, Jacksonville 6, Fla.

For More Details Circle No. 428—Page 182

SHELL MOLD PARTING

LE-460 silicone parting emulsion for use in shell molding is ready for use by diluting with tap water and stirring. The material is supplied in 1-gal bottles, 5-gal drums, or 55-gal drums. The emulsion is said to be especially adaptable to high-production shell molding because of its resistance to buildup. It reportedly is resistant to repeated cycles of freezing and thawing and has excellent shelf life at room temperatures. Made by **Union Carbide Corp.**, Silicones Division, 30 East 42nd St., New York 17, N. Y.

For More Details Circle No. 429—Page 182

TESTING MACHINE

Test data, such as offset yield strength, are printed automatically by an electric typewriter used in conjunction with an Electromatic testing machine. The date printer will record yield strength by the desired percentage of offset, ultimate strength, and an identifying test number without operator attention. The testing machine is operated in the usual manner. Electronic signals to operate the printing control mechanism are generated both by the extensometer affixed to the specimen and the Selectorange indicating system. Other models for printing multiple yield points by the extension under load method, ultimate strength, moduli, areas, and other test data are being developed. Made by **Tinius Olsen Testing Machine Co.**, 7279 Easton Rd., Willow Grove, Pa.

For More Details Circle No. 430—Page 182

PAINT SPRAY GUN

Paint gun slings paint instead of propelling it with air like conventional air spray guns. Heart of the gun is a nylon worm gear that force feeds any viscosity paint or other material up its hollow stem to spinning rotors that sling the liquid out a gate-like opening in a pattern ranging from ¼ to 12 in. in width. An electric motor powers the unit at speeds of 5, 10, or 15 rpm and furnishes the paint power of about a 1 hp compressor unit for an air spray gun. Marketed by **Napco Inc.**, 3472 Fairmount Blvd., Cleveland 18, Ohio.

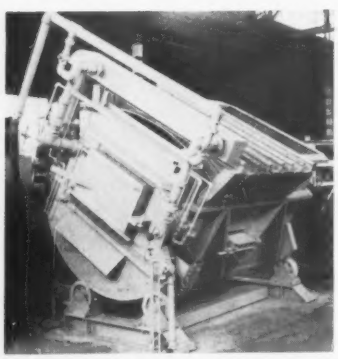
For More Details Circle No. 431—Page 182

MERCURY VAPOR LAMPS

Four new mercury vapor lamps are available. Two are 1000-w, color-improved lamps, while two are in the 425-w line. The larger lamps are semireflector types and many existing installations using 1000-w lamps may obtain more light by installing the new lamp (D-H15 or D-H12) in place of the existing lamp. The 425-w lamps are designed for use in 277/480 v systems. Made by **Sylvania Electric Products Inc.**, 1740 Broadway, New York 19, N. Y.

For More Details Circle No. 432—Page 182

Furnaces Provide Continuous Supply of Metal



TILTING reverberatory furnaces, gas or oil fired, have been engineered to provide a continuous supply of aluminum from a central source to holding furnaces used in conjunction with diecasting, permanent mold casting, sand casting, and similar applications. Furnaces can be charged, fluxed, alloyed, and cleaned easily, and maintenance and relining are simplified by removal of spring-loaded bung arches which form the entire roof.

Holding capacities are 1000, 1700, 2500, and 3000 lb with hourly melt rates closely paralleling the rated capacities. Manufacturer reports the furnaces are able to provide hot metal from a cold start in 1 to 1½ hr, depending on furnace size. Made by **Stroman Furnace & Engineering Co.**, Franklin Park, Ill.

For More Details Circle No. 467—Page 182

LITERATURE

Blast Cleaning Unit

Mechanical, electrical, and general specifications of No. 2, Multitable airless blast cleaning machine equipped with a variety of rubber-covered worktables are presented in Catalog 140-D‡—**Wheelabrator Corp.**, 1102 South Byrkit St., Mishawaka, Ind.

For More Details Circle No. 433—Page 182

Air and Vacuum Pumps

Construction details, dimensions, capacities, performance curves, and installations of rotary air and vacuum pumps, gas boosters, and air pumps are described in Catalog 757.—**Leiman Bros. Inc.**, 102 Christie St., Newark 5, N. J.

For More Details Circle No. 434—Page 182

Wire Rope Abrasion

Bulletin 101 describes the principal causes of wire rope abrasion and lists several practical suggestions for minimizing its effects.—**Leschen Wire Rope Division, H. K. Porter Co.**, 2727 Hamilton Ave., St. Louis 12, Mo.

For More Details Circle No. 435—Page 182

Ductile Iron

Specifications, production methods, characteristics, and applications of ductile iron are highlighted in Vol. 4, No. 3 of *Carbon & Graphite News*.—**National Carbon Co.**, division of Union Carbide Corp., 30 East 42nd St., New York 17, N. Y.

For More Details Circle No. 436—Page 182

Fork Lift Trucks

Bulletins 1317 and 1380 illustrate and describe the battery-powered FT-20 and gasoline-powered FGF-20 fork lift trucks, respectively. — **Baker-Raulang Co.**, Box 5579, Cleveland 2, Ohio.

For More Details Circle No. 437—Page 182

Sand Conditioning Unit

Magna-San sand conditioning unit featuring advantages of aeration, blending, and mixing, plus magnetic separation is highlighted in Bulletin RM57.—**Royer Foundry & Machine Co.**, 158 Pringle St., Kingston, Pa.

For More Details Circle No. 438—Page 182

Fire Prevention

Booklet on fire prevention and firefighting procedure is intended to impress upon the employee his responsibility in regard to fire loss. It tells what to do before and after firemen arrive and gives advice on how to handle different types of extinguishers. — **Boston**

USE THIS CARD FOR ADDITIONAL DETAILS ON EQUIPMENT, SUPPLIES AND LITERATURE DESCRIBED IN THIS SECTION

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403	423	443	463	483	503
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412	432	452	472	492	512
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For Foundrymen

Manufacturers Mutual Insurance Co., 225 Wyman St., Waltham 54, Mass.

For More Details Circle No. 439—Page 182

Metal Handling

Photographs, dimension sheets, and pertinent data on molten metal handling equipment are featured in Catalog 58.—**Industrial Equipment Co.**, 271 Ohio St., Minster, Ohio.

For More Details Circle No. 440—Page 182

Coreblowers

Specifications, photographs, operational features, and general information on seven Flexiblo coreblowers are provided in Bulletin 5015.—**Beardsley & Piper, Division Pettibone Mulliken Corp.**, 2424 North Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 441—Page 182

Testing Machines

Complete line of Super L hydraulic universal testing machines are described in revised Bulletin 47. — **Tinius Olsen Testing Machine Co.**, 7119 Easton Rd., Willow Grove, Pa.

For More Details Circle No. 442—Page 182

Pillow Blocks

Photographs, drawings, dimensions, shaft sizes, weights, and radial load ratings of Spher-Align pillow blocks are offered in Bulletin A668.—**Dodge Mfg. Corp.**, Mishawaka, Ind.

For More Details Circle No. 443—Page 182

Heavy-Duty Hoists

Condensed descriptions and specifications of company's Series H heavy-duty, fully enclosed hoists are provided in Form 957.—**Euclid Crane & Hoist Co.**, 1365 Chardon Rd., Cleveland 17, Ohio.

For More Details Circle No. 444—Page 182

Conveyor Belting

Recommendation chart, "A Guide to Maximum Belt Life," is designed to simplify the selection of the right type of belting for each elevating or conveying job. —**Imperial Belting Co.**, 1756 South Kilbourn Ave., Chicago 23, Ill.

For More Details Circle No. 445—Page 182

Sand Controls

Complete line of equipment for testing and controlling physical properties of molding and core sands are contained in Catalog 118.—**Harry W. Dietert Co.**, 9330 Roselawn Ave., Detroit 4, Mich.

For More Details Circle No. 446—Page 182

SPACE HEATER CONTROL

Manually-operated gas flow control for space heaters incorporates an automatic pilot safety device which shuts off gas flow to both main burner and pilot light in case of pilot outage. Control knob has a metal stop which prevents accidental shutoff of pilot during normal operation. Designed for low-capacity, gas-fired space heaters, the control is available with or without a built-in dust and gum filter. Made by **Grayson Controls Division, Robertshaw-Fulton Controls Co.**, Long Beach, Calif.

For More Details Circle No. 447—Page 182

CRUCIBLE POURING LIP

Interlocking pouring lip for crucibles is supported on the crucible without external support prior to cementing. The lip is positioned in the proper angular relationship to the crucible for efficient pouring. The lip reportedly will not leak after cementing. Made by **Electro Refractories & Abrasives Corp.**, 344 Delaware Ave., Buffalo 2, N. Y.

For More Details Circle No. 448—Page 182

SWING FRAME GRINDER

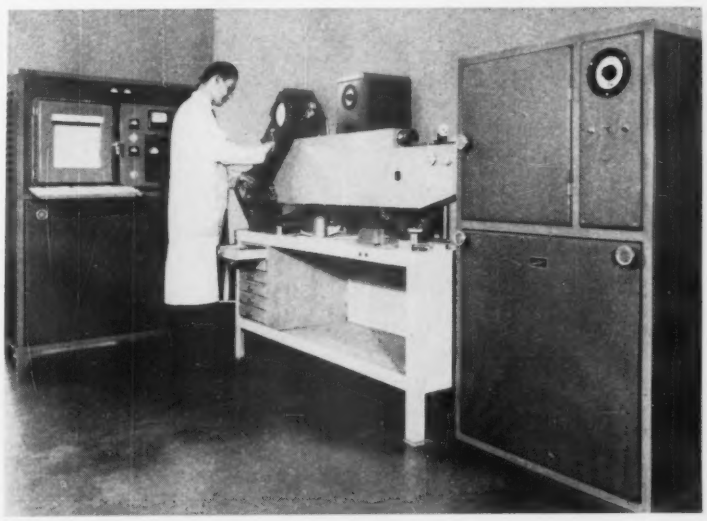
Heavy duty and extra heavy duty abrasive belt swing frame grinders are supplied in a wide range of power, belt widths and lengths, and are designed for tough, difficult grinding jobs. Standard machines adapt themselves to special applications in combination with other machines. Made by **Grinding & Polishing Machinery Corp.**, 2530 Winthrop Ave., Indianapolis 5, Ind.

For More Details Circle No. 449—Page 182

RADIAL-ARM MACHINES

Imperial line of radial-arm wood and metal cutting machinery is designed for nonferrous metal and heavy wood cutting applications. Strength is achieved by a steel table frame

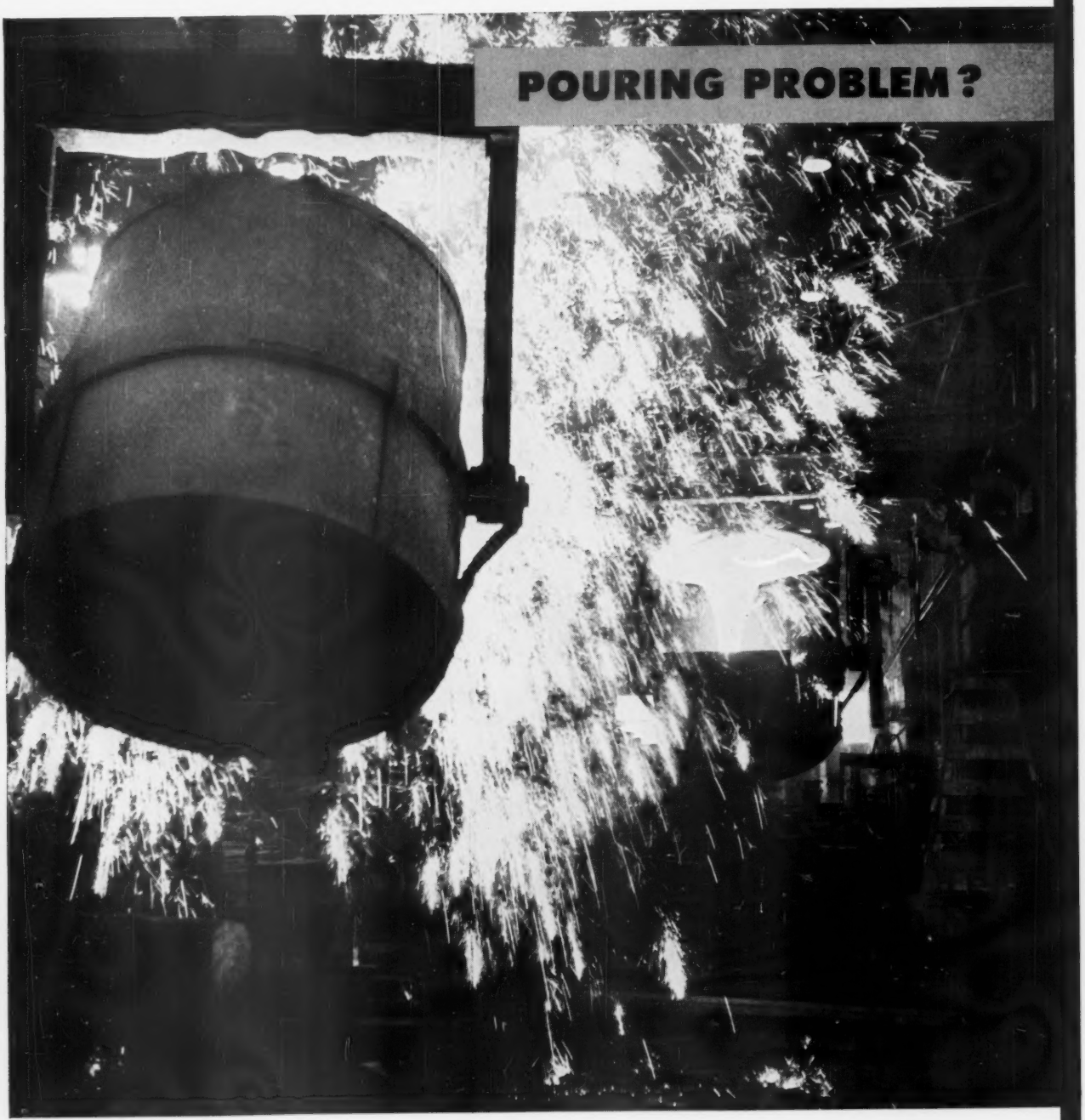
Analyzer Measures Values Instantaneously



DIRECT-READING analyzer for metals and other solids permits measurement of instantaneous values and direct reading of analysis results without resorting to integration. The Automatic Spectro-Lecteur incorporates two photomultipliers—one views the line of the basic metal in the alloy and the other travels automatically along the focal plane of the spectrum, stopping at selected lines for a determined length of time according to a prearranged program. This system provides continuous measurement of instantaneous values of the intensity ratio between the recorded lines and the basic metal lines.

In the photograph an electrostatic screening cabinet is on the right. A quartz spectrograph is in the middle (light gray) and at the left end of the spectrograph is a direct-reading head in front of the automatic control cabinet. On the left are the amplifier and control cabinets. The operator is sliding the direct-reading head into position by a micrometer drum, following the observation of the intensities of two direct-reading milliammeters. Distributed through **Intercontinental Electronics Corp.**, 1551 Franklin Ave., Mineola, N. Y.

For More Details Circle No. 468—Page 182



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A REPUBLIC PIG IRON METALLURGIST

He's right up-to-the-minute on all the latest foundry techniques. He knows all types of irons and their characteristics. Knows what they will do or will not do under certain conditions. His thorough knowledge is based upon a combination of years of actual foundry experience and metallurgical training.

He's a regular and welcome visitor in hundreds of foundries. They rely on him for expert advice on pouring problems, molding practice, improving castings, increasing output, reducing costs.

The Republic Pig Iron Metallurgist will give you the full story about Chateaugay and other Republic Irons. Republic, as the only producer of both Northern and Southern Irons, offers industry's only complete line of all grades of merchant pig irons. Northern grades include Malleable, Bessemer, Foundry, and Basic. Southern furnaces produce Foundry and Basic Irons.

Have a problem in your foundry? Then ask for the man who knows his irons—call in a Republic Pig Iron Metallurgist. His service is confidential and without obligation. Mail the coupon if you would like him to call at your foundry.

HANDLING PROBLEM? Standard and special units from Republic's complete line of materials handling equipment are solving problems at every stage of production. One company used the PB-120T Box and Skid Units shown above to reduce handling costs 25%, minimize inventory time, provide better visible product identification, free valuable floor space for production equipment. Republic Materials Handling Specialists will help you design units to meet your specific needs. Send coupon for Catalog No. 620.

STORING PROBLEM? Republic Wedge-Lock Steel Shelving solves the problem of storing dies, tools, patterns, etc. This exceptionally strong shelving is designed specifically for high stacking of enormous weights. Joints actually get tighter and stronger as weight increases. There's no sagging, swaying or buckling. Wedge-Lock assembles quickly and easily and is completely flexible to meet changing requirements. It's the answer to maximum loading in minimum floor space. Send coupon for Catalog ES-931.

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Circle 674 on Page 51

WHICH HOIST
fits your plant's needs?

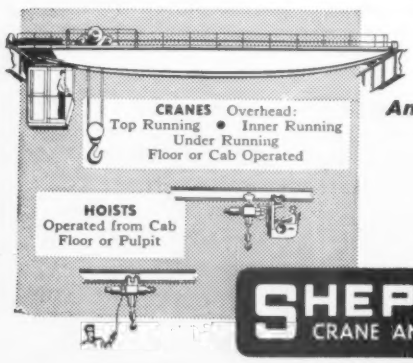
SHEPARD NILES
FLOOR-OPERATED HOIST

Operator primarily occupied with other duties. Uses hoist for fast, efficient handling of relatively short hauls.

SHEPARD NILES
CAB-OPERATED HOIST

Operator in cab moves loads along at high speeds, occupies best vantage point for spotting and stacking material.

THE RIGHT HOIST . . . can reduce your plant's handling costs. But which one is best for the job . . . a floor-operated hoist where the operator is freed for other duties or a cab-operated hoist where he is engaged fulltime moving loads through the air? Because Shepard Niles manufactures both types of hoists . . . as well as a complete line of cranes . . . we can approach your handling problem with an open mind.



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America's Most Complete Line

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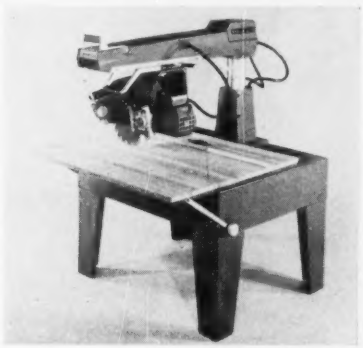
1388 Schuyler Ave., Montour Falls, N. Y.

supported by flanged legs. Cleats have replaced bolts in the table top. An adjustable front extension to the table top prevents the blade from extending beyond the table in the cross-cut position. Maximum rise between the table top and motor bottom is 16⅞ in. A double-acting con-



trol handle simultaneously unlocks the arm while disengaging the locating pin for changes from cutoff to miter positions. Built-in safety features are included. Made by **DeWalt Inc.**, Lancaster, Pa.

For More Details Circle No. 450—Page 182

WORK GLOVES

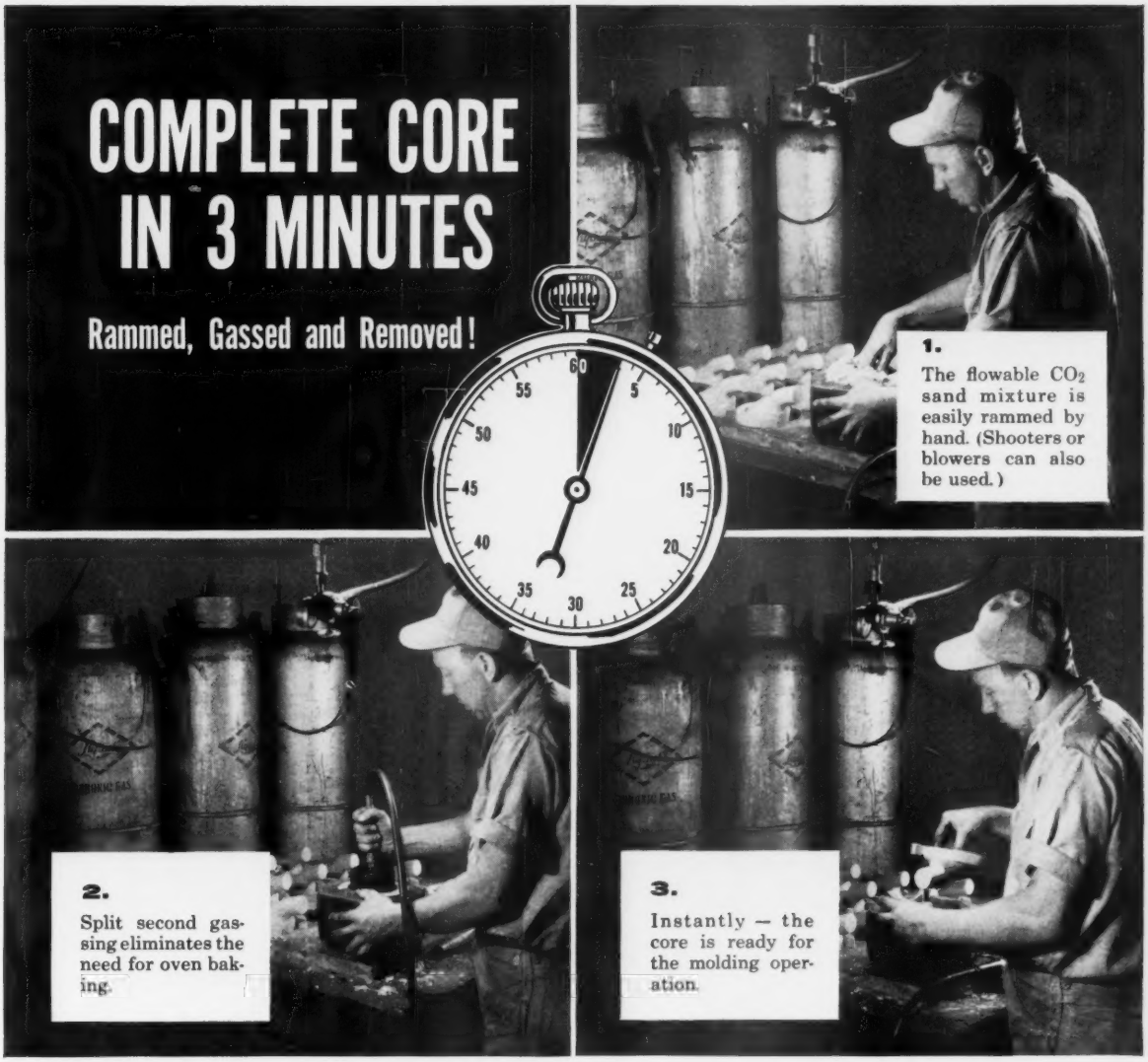
Twin palm nap-out canton flannel work gloves feature an extra thumb on each glove which tucks away until the glove is reversed for wear on the other hand. The manufacturer recommends wearing each set of palms through the second ply, then

changing back and forth until the gloves are worn out completely. The gloves are designed for protection against rough materials and insulation against heat. Made by **David's Gloves Inc.**, 23 West Pleasant St., Springfield, Ohio.

For More Details Circle No. 451—Page 182

JOINTER GUARD

Jointer guard features a cast aluminum standard with a Plexiglas plastic shield which permits the operator to see while he saws. The transparent shield covers the jointer's


COMPLETE CORE IN 3 MINUTES
Rammed, Gassed and Removed!
1.
The flowable CO_2 sand mixture is easily rammed by hand. (Shooters or blowers can also be used.)
2.
Split second gassing eliminates the need for oven baking.
3.
Instantly — the core is ready for the molding operation.

The CO_2 process proves to be a fast and economical method for core production at the J. M. Bruce Foundry in Cedar Grove, Wisconsin.

CO_2 PROCESS INCREASES CASTING CAPACITY . . . CUTS EQUIPMENT COSTS . . . ELIMINATES CORE STORAGE!

Glen and Mark Bruce, who operate the 40 year-old J. M. Bruce Foundry Co., are enthusiastic about the use of CO_2. An actual cash savings of thousands of dollars is reported due to the decrease in baking equipment and core storage. Valuable floor space previously used for core storage is now allocated to actual production use.

For J. M. Bruce Foundry Co. the big advantages in CO_2 are the increased size of the castings they can pour (without buying special core equipment)—50% reductions in core costs . . . virtual elimination of "plows". . . no danger of drops, soft or wet spots . . . reduced core handling, extreme speed and flexibility in supplying core needs, and *making cores only when they need 'em.*

Get the facts on CO_2 core and mold making—complete information sent upon request.

World's Largest Producer of CO_2

LIQUID CARBONIC

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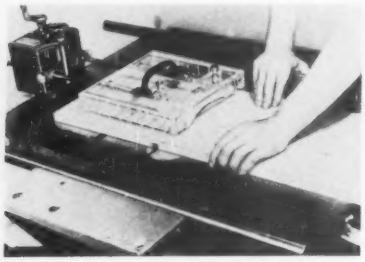
3150 South Kedzie Ave., Chicago 23, Illinois

rotating blades without obscuring them from view and also serves as a work speeding guide. The tool is adaptable to any conventional jointer of 4 to 12 in. size. In addition to the safety protection offered by the



guard, the guard itself exerts a steady downward pressure to hold stock firmly in position. Made by **Brett-Guard Co.**, 105 South Dean St., Englewood, N. J.

For More Details Circle No. 452—Page 182

FOIL TYPE STRAIN GAGE

Foil type SR-4 (bonded filament) strain gage is available in two new types to provide improved fatigue life, sensitivity, and hysteresis characteristics. The gages extend the useful "room temperature" range to 300° F for continuous duty and to 400° F for short time measurements. Made by **Electronics & Instrumentation Division, Baldwin-Lima-Hamilton Corp.**, Waltham, Mass.

For More Details Circle No. 453—Page 182

MATERIALS HANDLING

Expansion of company's materials handling division has resulted in several additions to its line of gas-powered, pneumatic-tired fork trucks with capacities from 1500 to 5000 lb and electric-powered fork and platform trucks with 1000 to 10,000-lb capacities. Speedall front-end loaders in capacities from 1½ to 3¼ yds, the Speed Crane, and the Speed Wing swing loader for use with bucket, fork, or crane adaptations, also are available. Made by **Pettibone Mulliken Corp.**, Materials Handling Equipment Div., 4700 Division St., Chicago 51, Ill.

For More Details Circle No. 454—Page 182

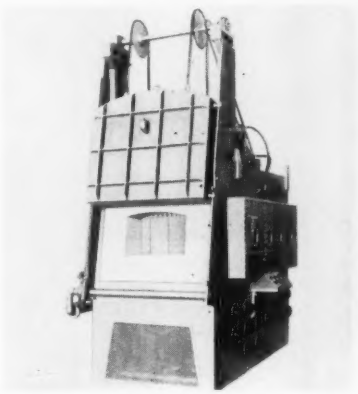
CASTING COUNTERS

Casting counters accurately tally pieces from 8 oz to 25 lb within clearances of 10 in. in height and 15 in. in width. Top of the unit may be raised for hand counting larger castings. The unit is engineered to prevent double counting. Models are available for small castings with selector switch for counting two to five pieces at a time. Made by **Hartley Controls Corp.**, Neenah, Wis.

For More Details Circle No. 455—Page 182

ELECTRIC FURNACES

High temperature furnaces are engineered for operation to 3000° F flash heats in oxidizing or neutral atmospheres, 2850° F continuous operation in oxidizing or neutral atmospheres, 2500° F continuously in reducing atmospheres. Furnaces are suitable for laboratory or production work. Model shown has a usable firing chamber 18 in. wide x 12 in. high x 160 in. long. Elements are silicon-carbide with low watt density. Door design is of power lift type with safety latch. Unit is complete with transformer which, in combination with furnace circuitry, provides eight zones of input control, four to the elements under the hearth and four to the elements above the hearth. Each zone is controlled by two six-point tap switches. Made by **L & L Mfg. Co.**, 136 Eighth St., Upland 86, Del. Co., Pa.



For More Details Circle No. 456—Page 182

COATED ABRASIVE DISCS

Mushroom-shaped molded rubber pad and coated abrasive discs are designed for contour grinding or polishing in small radii or difficult contours with portable tools. No center

HERE'S HOW!

- **FASTER MELTING** — one 400 series melts up to 11,000 lbs. of brass or bronze per shift and 6,000 lbs. of gray iron per shift.
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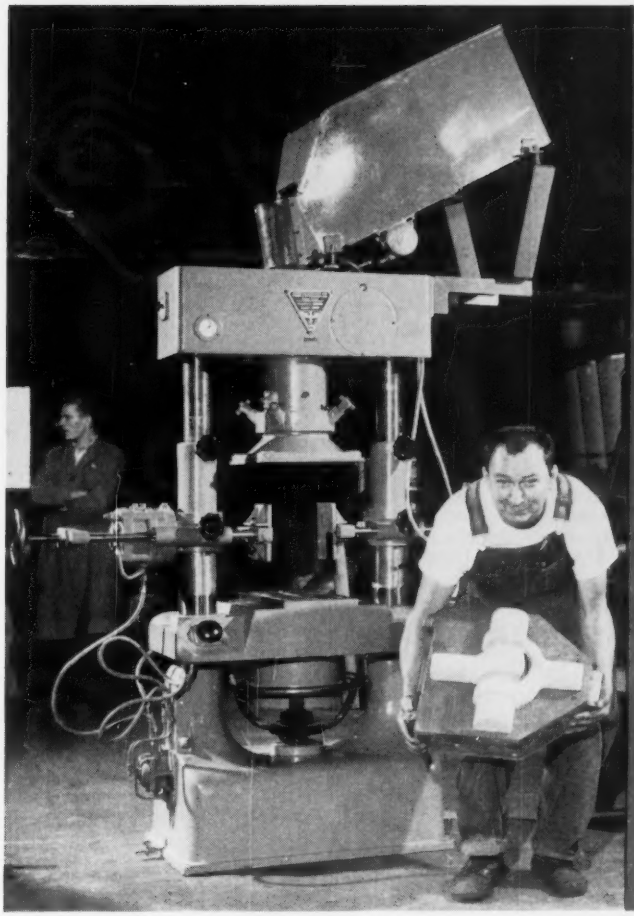

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Model KSA 210 is the newest in Carver's complete line of Core Shooters. Completely push-button automatic, 100% pneumatic operation.

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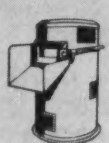
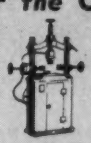
Only CarVer Has Everything For the CO_2 Process!



CARVER Rapid Muller



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As an integral part of sand preparation machinery like the unit shown at the left . . . or used alone below apron conveyors, chutes or spouts . . . no other permanent magnetic separator compares with the Dings Perma-Drum for efficient, *low-cost* separation of iron from foundry sand.

It's the most powerful drum-type separator available. Operation is completely automatic . . . requires no attention, little maintenance. Life-time magnetic power is guaranteed.

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Dings

Magnetic Pulleys | Lifting Magnets | Self-Cleaning Suspended Magnets

Circle 679 on Page 51

GOT MELTING PROBLEMS?

Solutions to gray iron foundry problems often come easier to outside consultants. To get expert help, call a Semet-Solvay metallurgist . . . he's a practical foundryman whose job it is to help you.

The high uniform quality of Semet-Solvay Foundry Coke plus expert help from our metallurgist will solve your cupola problems.

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For Better Melting

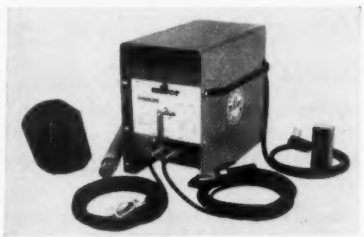
nut is required to fasten pad to disc. Discs are held in place by an adhesive packaged in tube applicators. Discs are made from an aluminum oxide abrasive cloth with an all-resin bond in grits 120-X, 80-X, and 50-X. Pads

of 5 and 8 in. diam are made in proper density for polishing. A 5-in.-diam pad also is made in a harder density for stock removal. All may be used on any portable pneumatic or electric grinder. Made by **Behr-Manning Co.**, a division of Norton Co., Troy, N. Y.

For More Details Circle No. 457—Page 182

WELDING MACHINE

M-180-P general utility welder provides continuous, precise, fingertip current control through a movable shunt regulator. Amperage indicator on panel gives correct setting for



each job. Standard equipment includes 6 ft of 3-conductor primary cable with 3-prong plug and wall receptacle; 20 ft of No. 4 electrode cable with electrode holder; 15 ft of No. 4 ground cable with clamp; welding helmet, and 5 lb of assorted electrodes. Made by **Miller Electric Mfg. Co.**, Appleton, Wis.

For More Details Circle No. 458—Page 182

AUTOMATIC DOOR OPENER

Overhead traveling crane opens and closes doors automatically. Crane can be used throughout the length of the runway without interference from the door or building construction. Crane

attaches itself automatically to runway door, pushes it to end of runway, and automatically disengages, leaving runway door anchored in place at end of runway. When necessary to close runway opening, operator eases crane

against runway door, automatically attaching crane to it, and pulls it back to opening in building where door disengages itself from the crane and assumes its proper position in door opening. Made by **All-States Engineering Co.**, 7092 North 76th St., Milwaukee, Wis.

For More Details Circle No. 459—Page 182

DIRECT-DRIVEN FANS

Low static type direct-driven fans employing four-blade Macheta airfoil propellers are available in ring, square panel, and duct types, in sizes from 24 to 48 in. diams. Ring and panel types are designed with curved orifice rings to provide a uniform flow of air to the propeller blades. Panel type is installed with four corner bolts. Duct type is used in standard application dust sections, with the entire unit inside the air stream. Made by **Aerovent Fan Co.**, Piqua 28, Ohio.

For More Details Circle No. 460—Page 182

SHAFT-MOUNTED DRIVES

Higher ratios of 24:1 (or 20:1 in two smaller sizes) have been added to company's all-steel, double reduction, shaft mounted drives. Advantages attributed to the higher ratio units include the use of smaller sheaves to obtain a given output speed and reduced motor cost. Units are available for horizontal and vertical application in ½ to 30 hp ranges with output speeds as low as 5 rpm. Made by **Falk Corp.**, Dept. 255, 3001 West Canal St., Milwaukee 1, Wis.

For More Details Circle No. 461—Page 182

LEVEL CONTROL

Model CL-10 Dynatrol level control is designed for high or low point detection or narrow range proportional control of liquid, solid, and slurry levels. The control features a positive-acting, electrical output control signal that varies with the amount of immersion of a vibrating paddle in the medium being detected. The output signal can be used to control the operation of any type of electrical equipment. Unit is rated for 3000 psig pressure. Made by **Automation Products Inc.**, 3030 Max Roy St., Houston 24, Tex.

For More Details Circle No. 462—Page 182

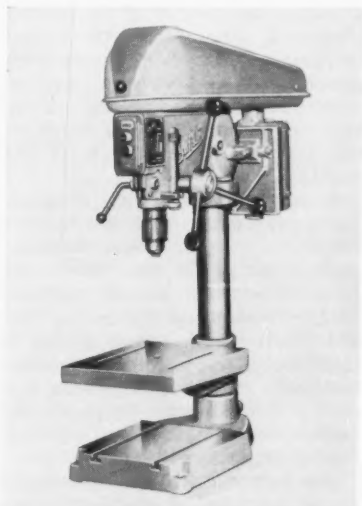
ULTRASONIC TRANSDUCER

Ultrasonic testing transducer extends the advantages of ultrasonic thickness gaging and flaw detection to materials which have been difficult or impossible to test with standard transducers. Testing is nondestructive as access to only one side of the work is required. Immersion-mounted Type Z transducers are waterproof and designed for continuous operation at up to 250° F. Contact testing transducers will withstand temperatures up to 450° F. Made by **Branson Instruments Inc.**, 40 Brown House Rd., Stamford, Conn.

For More Details Circle No. 463—Page 182

DRILLING MACHINES

No. 15 drilling machines feature design changes to facilitate operation, maintenance, and flexibility. Improvements include a front-mounted



start-stop pushbutton switch, speed range table, depth gage graduated for simplified setting, and a three-grip spindle feed. No tools are needed for adjustments of head and table. Line includes bench, floor, and pedestal models. Bench and pedestal models are available in one to six spindle models. Attachments are available for tapping, mortising, routing, or back spot-facing. Made by **Buffalo Forge Co.**, Buffalo, N. Y.

For More Details Circle No. 464—Page 182

NARCOLINE NARCOLINE

Slag-Resistant Plastic Refractory

NARCOLINE NARCOLINE

NARCOLINE Assures Cleaner Castings

It successfully resists the erosive and corrosive action of metals and slags, eliminating refractory inclusions from the casting.

NARCOLINE Facilitates Metal Flow

It resists graphite burnout under operating conditions, and maintains a lasting lubricated surface for easy metal flow.

NARCOLINE Assures Easy Slag Removal

It resists the wetting action of molten metal and slag, permitting ladles to be cleaned of solidified metal and slag with little effort.

NARCOLINE Easy to Install

It can be rammed to any desired shape with mallet or air hammer. Requires no special training to install.

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Circle 681 on Page 51

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Circle 682 on Page 51

Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"pH? perHaps"

IF my information is correct, control of the pH factor in clay is essential to success in the ceramic industry. Since clay is an all-important constituent of molding sand, it would seem logical to believe that the behavior of this clay might be affected by its acid or alkaline character. This assumption has been verified during the past five years by a number of eminent authorities on sand practice.

When first brought to our serious attention, the subject of pH control created a considerable stir among thoughtful foundrymen. Papers were presented, talks delivered, and at least one roundtable group assembled to exchange opinions based on the individual experiments of its members.

A substantial majority of those concerned reported that they had obtained no tangible results by fluctuating the pH of their sands. An adamant minority insisted, however, that by controlling this factor, they had greatly reduced casting loss in their foundries. Sand had improved noticeably in moldability—with less nailing and gaggers required—and made possible generally improved casting appearance.

One writer stated that with continued treatment of sands with soda ash to maintain a pH value of 8 to 9, he had increased the "tensile-feel" of his system sand and reduced the drying-out tendency to a noticeable degree.

We Gave It a Try—These optimistic reports probably were reflected in the increased sale of soda ash. Stimulated by the enthusiasm of the reporting minority, your inquisitive correspondent decided to launch a rather crude investigation of his own. With the consent, approval, and proffered assistance of the company's manager and chemist, we purchased a pH meter and proceeded to test all of our sand, as well as the tap water and the sand additives.

Results were interesting, but not very enlightening. Our sand tests were made daily over a ten-month period.

New sands all registered acid, ranging from 5.8 to 6.5. Southern bentonite was 5.1, and soft-wood flour carried the lowest reading, 4.4. On the basic side, ranging from low to high, fire clay was 7.9, seacoal 8.6, and western bentonite 9.5. These figures remained rather constant throughout the tests. Tap water varied from 7.7 to 8.6.

Our main interest was with our system sand, which carried a goodly ratio of seacoal and wood flour as well as a blend of the two bentonites. We reconditoned about 50 tons of this sand daily. The foundry had no unusual trouble either before or during the tests, a factor which probably explains our inability to detect results, either good or bad, as the pH values were raised or lowered. Prior to the introduction of soda ash, our system sand gave pH readings of from 7.4 to 7.6. No acid was introduced, and no readings below 7.3 were obtained at that time.

By adding 1 lb of soda ash to each ton of mulled sand, we secured a basic reading of 9.0, but we could observe no difference in sand behavior.

Then, acting on the assumption that a still higher basic condition might be desirable, we raised the pH to 10.0, but still without tangible results.

Consequently, we discontinued the use of soda ash and allowed the sand to return gradually to the old pH, 7.4, where it since has remained—or we supposed it had.

Back to Normal—Having learned nothing, we dismissed all thought of pH control, and for the following nine months sand behavior remained reasonably normal. We suffered our share of sporadic trouble, of course, but most was due either to high or low moisture or to hot sand—the conventional problems.

About three months ago, however, molders began to complain of stick-downs and of a brittle condition—also of an increasing amount of crush and sandwash. Despite the fact that our lab tests gave the sand a clear bill of health, we increased compression strength with western bentonite and made several adjustments in moisture, but all to no avail. The brittle condition persisted. We blamed everything we could think of and made several changes

in the mix. Even an addition of corn flour gave little relief.

After exhausting our list of hitherto dependable remedies, we decided to check our pH once more. The reading was 7.1, the lowest we ever had recorded. Grasping for the proverbial straw, yet with little hope of gaining anything, we again began adding soda ash—this time, ½ lb to each ton of sand. Our pH immediately jumped to 8.6, and the improvement in sand behavior was truly remarkable.

We continued these soda ash additions for ten days, with the pH holding steady at 8.6. Flowability of the sand was improved, a more stable mold condition obtained, wash and crush were minimized, and we were able to eliminate most of the nails and gaggers—a practice that had been increasing gradually.

Of course, we were willing to credit our success to this 8.6 pH reading, yet we still entertained a disturbing doubt. Had something else occurred of which we were not aware? Whether the pH factor determines or merely indicates behavior of our sand properties is a moot question. With such varied ingredients in an iron-sand mixture, isn't it likely that at times a delicate balance exists which may be effectively influenced by a slight change in the acid or basic reading?

Confirming Evidence — We were asked recently to test sands from a neighboring steel foundry. Four samples were submitted, representative of the shop's active heap and facing material. The pH reading of Sample No. 1 was 7.6; Sample No. 2 was 7.2; Sample No. 3 was 8.4; and Sample No. 4 was 9.0. In reporting my findings by telephone, I was not surprised to learn that sands 1 and 2 were the real offenders, with No. 2 giving the most trouble. Three and four seemed to be doing a good job. This shop reports that since its attempts at pH control, a definite improvement in sand behavior has been observed.

With this revived interest in the possibility of benefits to be derived from pH control, I have been rereading the literature devoted to it in the hope of catching something previously overlooked. As previously mentioned, one writer stated that with continued treatment of sands with soda ash to maintain a pH value of 8 to 9, he materially reduced the drying-out tendency. I have had some indication of the truth of this.

It generally is conceded that pH control will not in itself assure good sand behavior unless all other conditions are reasonably compatible. Moisture and clay content are equally important, and allowance must be made for the decomposition of organic materials. This latter could prove a disturbing problem, especially in a jobbing shop where casting sizes, and hence sand punishment, vary greatly.

Although I continue to look askance at all professed panaceas, I must admit that on the basis of this brief experience with soda ash, it would seem that pH control must be considered an important phase of foundry sand practice. I believe that the subject deserves continued study.

"I still say a cutter would be more thorough."

Book Review

Typical Microstructures of Cast Metals, edited by G. Lambert, cloth, 7 x 10 in., 224 pages, published by the Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester 3, England. Price 21s to members and 84s to nonmembers of the Institute.

This book presents a collection of photomicrographs of well-established foundry alloys as well as recent developments in cast iron, steel, and nonferrous alloys. British standards are used where convenient but many illustrations are included where no relevant British standard has been established. In most cases actual chemical composition and mechanical properties are given. In other cases, typical data are listed.

The editor notes that where photomicrographs, chemical composition, and mechanical properties are related to a British standard they do not necessarily represent the sole structure, composition, and combination of properties which will satisfy the specification. The use of British standards is essentially for convenience in classification and does not detract from the value of the work to American readers since the examples chosen are representative of universal castings production.

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Sand packs tight through open coil for rigid support in mold.

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Uniform stems simplify molding, prevent annoying sand break-outs.

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Circle 683 on Page 51

PERMABRASIVE is the only pearlitic malleable iron shot and grit on the market. Pearlitic malleable iron is made with the proper analysis and controlled heat treatment. The result is malleable iron with a more durable structure and, in abrasives, "pearlitic" means a greater resistance to break down, longer life, greater cleaning ability with all the advantages of lower abrasive costs, lower maintenance costs, faster cleaning!

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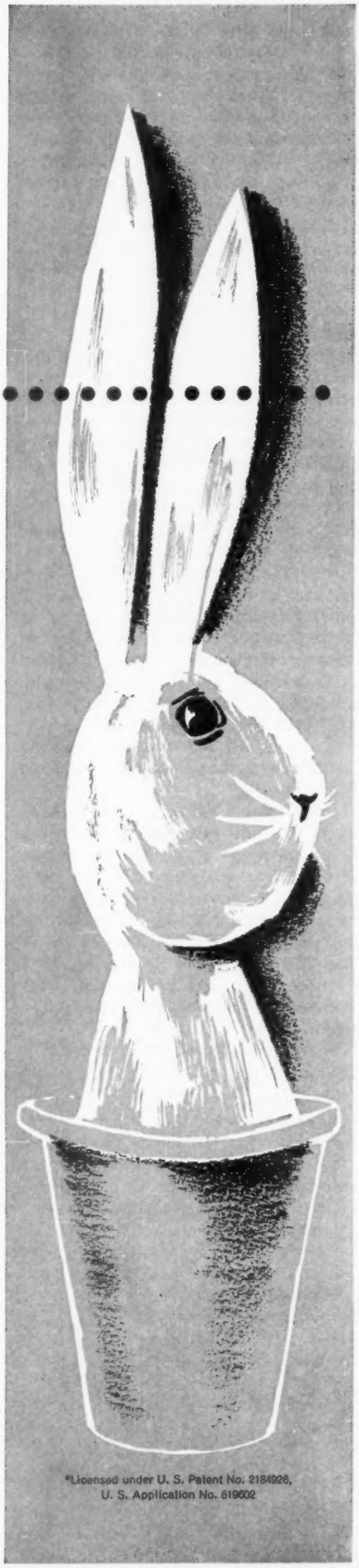
National Metal has been making pearlitic malleable shot and grit for several years. Permabrasive—the only pearlitic malleable shot and grit—has been a pioneer in the field of premium quality abrasives and has saved thousands of dollars for hundreds of foundries!

Sure, Permabrasive pearlitic malleable shot and grit costs a little more per ton than ordinary annealed abrasives. That's because it costs more to make. But its use has snow-balled, because it saves money on abrasives used and cuts maintenance costs substantially. *Your* savings are *guaranteed in writing* when Permabrasive goes to work in your blast cleaning room.



*Licensed under U. S. Patent No. 2184926, U. S. Application No. 619602

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No one blames you for being tired of making endless, complicated tests to prove every claim that comes along! We suggest you use a "time-meter"—and reduce your operation to simple "wheel-hours." An office boy can keep the records—doesn't interfere with operations—gives you all the dope you need on abrasive consumption, evaluating materials and equipment parts, and furnishes excellent cost records. Write for free folder: "Tired of Testing!"

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Obituary

HERBERT S. SIMPSON, 73, former president, National Engineering Co., Chicago, died Nov. 3 in Phoenix, Ariz. Born in Minneapolis, he was educated in Chicago and started his business career in Cleveland in the manufacture of clay working machinery. Mr. Simpson also was associated in business with his father, Peter L. Simpson, a foundry operator who organized the National Engineering Co. Mr. Simpson succeeded his father in the presidency of the company on the latter's death in 1917, continuing in that capacity until 1943, when he was succeeded by his son, Bruce L. Simpson. For many years active in the American Foundrymen's Society, Mr. Simpson was its president in 1941-42. He was also a past president of the Foundry Equipment Manufacturers Association.

HERBERT S. SIMPSON

Frank H. Reynolds, 76, former foundry owner, died Oct. 6, in Indianapolis. He was a retired metallurgist for Allison Division, General Motors Corp. Mr. Reynolds had owned the former Crawford & McCrimmin Foundry, Brazil, Ind., and the old G & R Foundry, Terre Haute, Ind. He also had been associated for several years with the Terre Haute Div., American Car & Foundry Co.

Dr. Paul D. Merica, 68, who retired in 1954 as president, International Nickel Co. of Canada Ltd., and its subsidiary, International Nickel Co., New York, died Oct. 20. With International from 1919, he was director of research, and became vice president of the parent company in 1936. In 1952 he was named president of both companies.

Raymond R. Howell, 68, former secretary, Thiem Products Inc., Milwaukee, died Oct. 11, in Port Washington, Wis. Mr. Howell was secretary of the company from 1952 until he retired last year. Previously he was associated with Vilter Mfg. Co., Milwaukee.

Stanley B. Davies, 69, president of the Royer Foundry & Machine Co., Kingston, Pa., manufacturer of foundry equipment, died Sept. 27 at his home in Dallas, Pa. A son, Stanley S. Davies, is general manager of the company.

Oscar H. Schildknecht, from 1953 until his retirement last year, chairman of the executive committee, Maynard Electric Steel Casting Co., Milwaukee, died Oct. 26. He joined the company in 1917 and was its sales manager for many years.

Harry L. Aiken, 82, former president, Crucible Steel Casting Co., Cleveland, died Oct. 24. He was graduated from Case Institute of Technology and founded Crucible Steel in 1907, retiring in 1955.

Louis C. J. Weckerley, 86, for the last 20 years president Ferguson & Lange Foundries, Inc., Chicago, died Oct. 18.

John C. Dabney Jr., 68, retired vice president, secretary, and treasurer, Glamorgan Pipe & Foundry Co., Lynchburg, Va., died Oct. 3.

Phil Ake Sr., operator, Diamond Castings Co., Johnsonburg, Pa., died Sept. 10.

S. S. Hibbard, 57, chief engineer, Dobbie Foundry & Machine Co., Niagara Falls, N. Y., died Sept. 1.

Otis Hutchins, 68, former director of research, Carborundum Co., Niagara Falls, N. Y., died Aug. 27.

Donald B. Dean, sales representative, Modern Aluminum Castings Co., Terre Haute, Ind., died Sept. 20.

GENERAL REFRACTORIES

A COMPLETE REFRACTORIES SERVICE...

for the Foundry Industry

BRIKRAM 80

A high alumina ramming mix, is giving outstanding service in many foundry furnace applications.

BRIKRAM 80 when rammed in place behind rigid forms, forms an excellent refractory lining wherein temperature and resistance to strong flux or slags are desired.

BRIKRAM 80 is used to construct the lower side walls and bottoms of aluminum melting and holding furnaces, center sections of electric furnace roofs and side walls and bottoms of malleable iron furnaces.

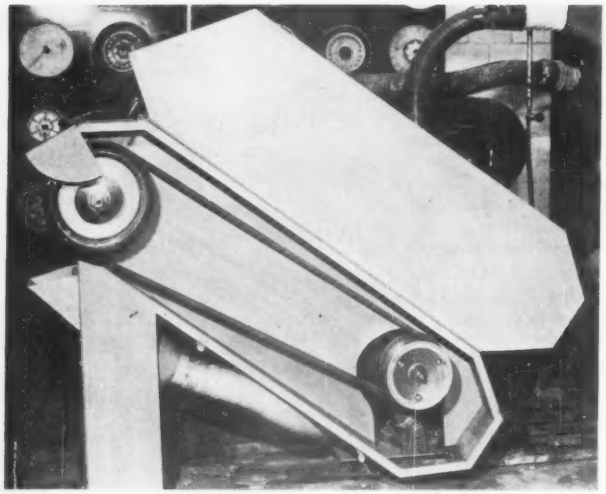
BRIKRAM 80, because of its high alumina content, is recommended for use in desulphurizing units where soda ash and other potent fluxes are used. Ladle life can also be increased by using BRIKRAM 80 in the places where the severe wear occurs. In case of ladles holding high temperature stainless steel, or other metals, long service is given by BRIKRAM 80.

For abrasion conditions, HIGH STRENGTH BRIKRAM 80 is available. This material takes a very hard air set and maintains it up to the softening point of the material.

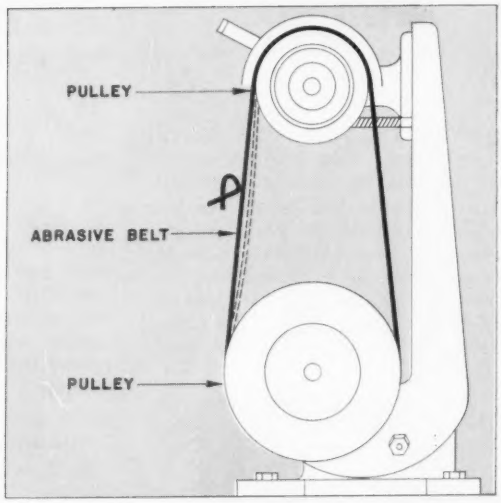
Consult your local GREFCO representative for more complete details of these, and other GREFCO, products.

GENERAL REFRACTORIES CO.
Philadelphia 2, Pa.

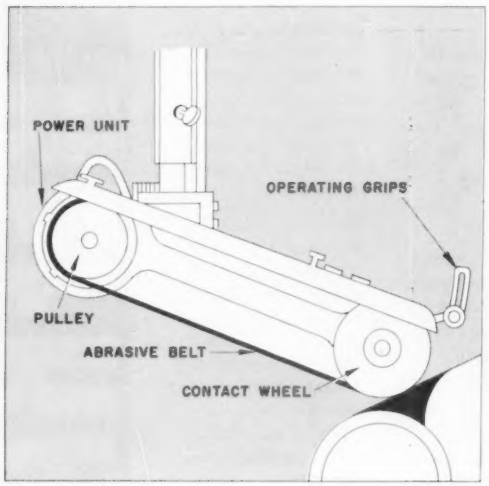
Circle 685 on Page 51



Idler mechanism (right) for this type of backstand is on floor. Contact wheel (left) acts as drive wheel



Deburring unit usually is attached to bench lathe, can handle both light and heavier burr removal



Swing grinder and polisher can be maneuvered for spot or surface sanding of large objects

Smoothing parting line on an aluminum casting. Switch to a backstand grinder raised production 600 per cent

Coated Abrasives

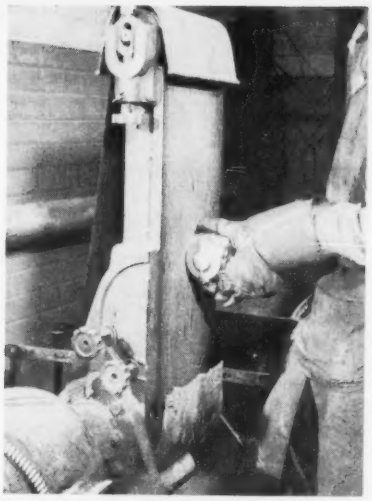
Grind All Types of Castings

By G. G. WILLSON
Manager, Technical Services
Coated Abrasives Division
Minnesota Mining & Mfg. Co.
St. Paul, Minn.

LATEST developments in coated abrasive constructions, along with up-to-date equipment and proved methods of application, are making this grinding and finishing medium especially adaptable to the ever-increasing needs of modern foundries for good, consistent finishes at low cost per piece.

The several types of coated abrasives—belts, discs, bands and wheels—coupled with many combinations of backings, minerals, and adhesive bonds, have made it possible to accomplish almost any type of grinding or finishing job.

High on the list of recent coated abrasive improvements is the development of ultra-strong, heat-resistant resin bonds used to hold the abrasive grains to the backing. In operations such as snagging, removing parting lines and gate and riser stubs, the demand is for a grinding medium that will withstand heavy shock, oppose the slashing of sharp edges, and resist the intense heat which builds up between the work piece and the abrasive. For jobs requiring a lubricant, the grinding me-



Stationary platen machine grinding the surface of an aluminum casting

Large disc on stationary face plate sizes bottom of an aluminum casting

COATED ABRASIVE APPLICATIONS FOR NONFERROUS METALS

Operation	Type of Machine	Recommended Grit				Recommended Coated Abrasive (All aluminum oxide mineral)
		Rough Grinding	Intermediate Grinding	Finishing	Polishing	
BELT SANDING	Backstand	24	50			Resin bond cloth belts
				120	240	Resin/glue cloth belts
	Swing Grinder and Polisher	24	50			Resin bond cloth belts
				120	240	Resin/glue cloth belts
	Stationary Platen	36	60			Resin/glue cloth belts (dry) Waterproof cloth belts (lub)
				120	240	Resin/glue cloth belts (dry) Waterproof cloth belts (lub)
	Portable Platen	36	60			Resin bond cloth belts
				120	240	Resin/glue cloth belts
	Deburring	50				Resin bond cloth belts
			80	120	180	Resin/glue cloth belts
	Unsupporting	60				Resin bond cloth belts
			80	120	240	Resin/glue cloth belts
	Outside Diameter Grinder and Polisher	50				Resin bond cloth belts
			100			Resin/glue cloth belts
				150	240	Resin/glue cloth belts (dry) Waterproof cloth belts (lub)
DISC SANDING	Portable	36	50	100	120	Type C discs
	Stationary	36	60	120		Resin/glue cloth discs
SPINDLES AND MANDRELS	Flexible Shaft Portable Drills	36	80			Resin/glue cloth: cartridge rolls, bands, sleeves, discs, cones
				150	240	Glue bond cloth: cartridge rolls, bands, sleeves, discs, cones
HAND PAD AND OSCILLATING SANDER	Pad or Oscillating Sanders	1/2(60)D	3/0(120)C			Aluminum oxide paper sheets
				5/0(180)A	7/0(240)A	Aluminum oxide finishing paper
	Hand	60	120	180	240	Aluminum oxide cloth sheets (electrostatically coated) or utility rolls

dium also must withstand the presence of oil, water, or grease.

In doing all of these jobs, however, the grinding medium consistently must impart a specified finish, have an economically long life, and do the job in the shortest possible time so that an efficient rate of production can be established and maintained.

A coated abrasive belt, made with coarse grit aluminum oxide mineral grains positioned for maximum cut, a synthetic resin bond, and a strong, durable cloth backing meets those requirements. Used on a backstand or the belt head of an automatic machine, and backed up with an aggressive contact wheel, such a belt will handle the toughest grinding operations a foundry has to offer, whether it be on ferrous or nonferrous castings.

A major influence on the performance of a belt is the type of contact wheel which supports it and provides the working surface behind it. The action of the contact wheel and its effect on the belt to a large extent control cutting efficiency, belt life, and quality of finish.

Rubber contact wheels are plain-faced or serrated, with the serrated group offering several types designed for a variety of jobs. A serrated wheel has lands and grooves which usually angle across the face of the wheel, with the width and angle of the lands and grooves varying to provide different grinding characteristics depending on the wheel's use.

Thin lands and wide grooves running at a 45-degree angle on a hard rubber contact wheel, for example, generally are used with a coarse grit abrasive belt, such as the aluminum oxide resin bond cloth belt, for aggressive stock removal on large areas. Lands and grooves of equal width running in a 15-degree helix on a softer rubber wheel usually are used with a finer grit abrasive belt for polishing operations.

Flat or plain-faced wheels are employed when unit pressure on the belt is high enough to get the necessary breakdown of abrasive belt mineral for required cut. Such wheels in conjunction with a coarse grit (24 to 50) belt would be used for removing sharp gate stubs from brass, bronze, or aluminum castings.

The hardness of rubber wheels is

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Circle 687 on Page 51

indicated by durometer, which runs from 10 for sponge rubber to 100, indicating "rock hard." The softest rubber wheels in general use have a durometer of about 20. They are very conformable and remove a minimum of stock.

One of the newly developed rubber contact wheels is made of neoprene and has an X-type serration. It is conformable because the serrations are slashed, but it does not sacrifice aggressiveness because it has wider-than-usual lands providing more rubber surface for supporting the belt and longer wear. In foundries this type wheel is used for grinding and polishing parting lines and for snagging. It is capable of increasing abrasive belt life by as much as 40 per cent, according to data compiled by engineers who designed the wheel.

Cloth Contact Wheels

Cloth contact wheels are grouped into three general categories: Compressed canvas, laminated buff section, and folded-and-crimped buff section. Hardness of cloth wheels is designated as soft, medium, or hard, with variations such as super-soft and extra-hard. This type of contact wheel usually is used for finishing and polishing operations since it is conformable and removes a minimum of stock.

Contact wheels are employed on several types of machines, most popularly on a backstand installation powered by a bench or floor lathe. The backstand is used where work is light enough to be brought to the machine. In instances in which the work is too large or too heavy to be moved easily, an abrasive belt and contact wheel are fitted on a swing grinder, which is suspended from a monorail carrier and is highly mobile.

The recently-developed polishing and grinding wheels, known as PG wheels, have been successful, economically and practically, in medium stock removal and finishing. The wheel is formed by hundreds of coated abrasive leaves securely locked at the hub.

Large PG wheels, those 11 in. and up in diameter, are finding application on straight-line and rotary automatic machines and on floor lathes for offhand operations. Small PG wheels with diameters of 5 in. and up are employed on portable machines and bench lathes.

The principle of operation for PG wheels is as follows: As the wheel turns against the work piece the abrasive mineral, bond, and backing wear away together—slowly enough to provide long wheel life but rapidly enough to present a constantly

fresh abrasive surface to the work. The wheels remain sharp, and because of the action of the wheel the rate of cut remains constant.

Coated abrasive wheels can be preformed to fit a work piece; or, as in most cases, they will take the shape of the work piece without special forming. Whatever shape the wheel takes, it will hold that shape until presented to another surface, or until it is intentionally reformed.

There are jobs for which belts and wheels are not economically or practically suited. In such cases coated abrasive discs might meet the need. The problem of selecting the right disc for the grinding operation has been simplified with the introduction of an all-purpose disc for overall use. The life of abrasive discs has been lengthened by the use of improved bonding formulas and specially designed backup pad assemblies. Shelling, an age-old problem of discs, has been reduced by new mineral coating methods.

In addition to coated abrasive wheels, belts, and discs, there are coated abrasive sleeves and bands used, for the most part, on portable or flexible shaft equipment. These sleeves can be slipped on wheels which are expanded by air or centrifugal force to hold the sleeve in position. In the case of centrifugal devices, the faster the rotation the harder the wheel becomes; in the pneumatic devices the hardness is controlled by air pressure.

Probably 95 per cent of all coated abrasive products used in foundries are coated with aluminum oxide or silicon carbide mineral grains. Aluminum oxide finds wide application in ferrous foundries for heavy and

"Boo!"

an ounce of prevention!

It pays to periodically check the "health" of your blast-cleaning operation to prevent costs from creeping up. You may not be doing as well as say, a year ago. A check on abrasive prices (some have increased more than others), on abrasive consumption, on tonnage cleaned and on cost of replacement parts, will tell.

Such a check is easy to make using simple forms we supply. A sample set will be sent you on request.

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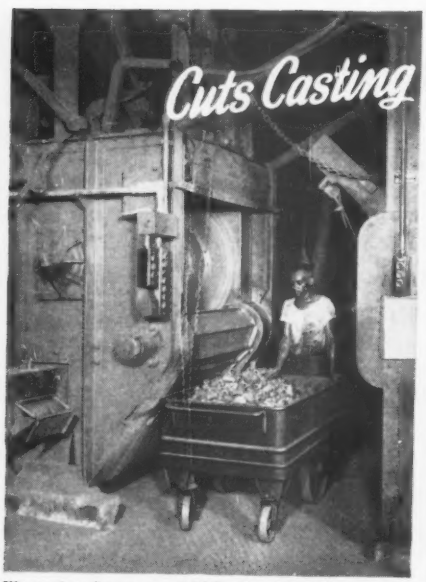

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Illustration shows one of 25 Sterling Heavy Duty Trucks in daily use at the Green Foundry, St. Louis, Mo.

Sterling FOUNDRY EQUIPMENT

A 5656-1/3

intermediate grinding, and especially rugged applications. It is particularly effective because each many-sided mineral grain has a sharp edge resembling a hollow-ground blade. This inherent sharpness, combined with the mineral's toughness, gives it the fast cut and long life required for economical grinding and finishing.

Silicon carbide is harder than aluminum oxide so it will penetrate almost any surface. Its brittleness and subsequent rate of breakdown make it less durable than aluminum oxide for some heavy grinding operations; however, it has proved advantageous for many nonferrous foundries. Silicon carbide products in grit 120 and finer are well suited to fine finishing because of the accurate scratch pattern imparted to the work piece.

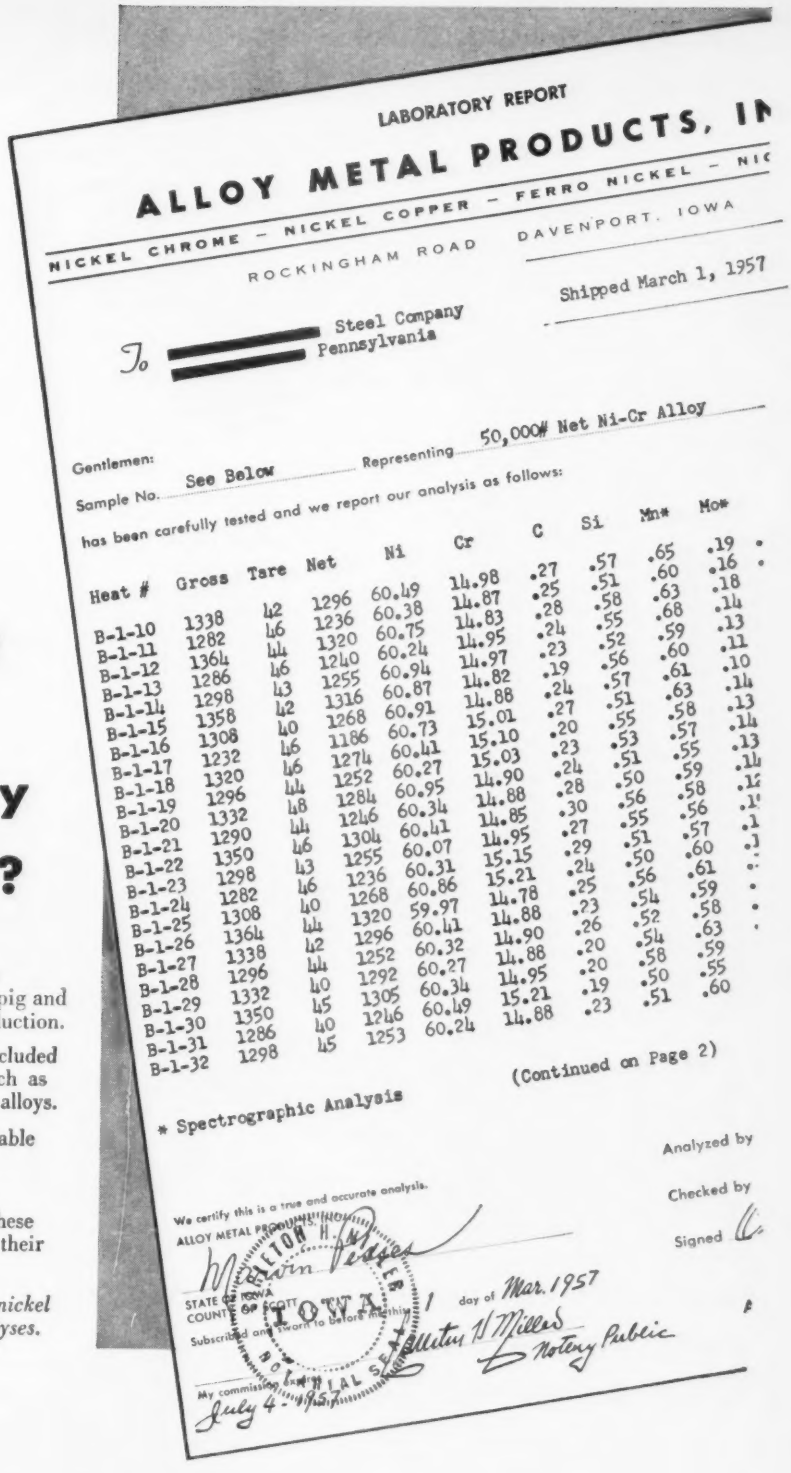
Bonding agents used to anchor mineral grains to coated abrasives used in foundries are made of synthetic resins which offer maximum strength and abrasive life. All resin coatings are moisture-resistant from the abrasive side, and, in operations requiring coolants of water or water-soluble oils, a waterproof backing is supplied to give the belt complete internal protection against moisture. An example of the latter type operation is the grinding and finishing of magnesium castings. Special precautions must be taken in grinding magnesium, and a magnesium supplier should be contacted for suggestions on control methods to be used.

A detailed study of coated abrasives by foundry personnel is not necessary for their successful use. Field engineers for coated abrasive manufacturers have this knowledge, and they are available to work closely with foundry operators to help pinpoint their specific needs and show them how best to utilize coated abrasives.

Book Review

The Elements of Foundry Costing, by H. P. Court and W. E. Harrison, paper-backed, 8 x 10½ in., 79 pages, published by the Council of Ironfoundry Association, 14, Pall Mall, London, S.W.1, England. Price $6.

This book is a compilation under one cover of a series of articles on foundry cost accounting in Great Britain. The articles were originally distributed to members of the Council of Ironfoundry Associations and were so popular that the present work in one volume resulted. The book covers all aspects of foundry operations and develops a system of cost ascertainment based upon uniform principles that can be applied to small as well as large operations.



LABORATORY REPORT

ALLOY METAL PRODUCTS, IN

NICKEL CHROME — NICKEL COPPER — FERRO NICKEL — NIC

ROCKINGHAM ROAD DAVENPORT, IOWA

To ═══ Steel Company
Pennsylvania

Shipped March 1, 1957

Gentlemen:

Sample No. See Below Representing 50,000# Net Ni-Cr Alloy

has been carefully tested and we report our analysis as follows:

Heat #	Gross	Tare	Net	Ni	Cr	C	Si	Mn*	Mo*	
B-1-10	1338	42	1296	60.49	14.98	.27	.57	.65	.19	•
B-1-11	1282	46	1236	60.38	14.87	.25	.51	.60	.16	•
B-1-12	1364	44	1320	60.75	14.83	.28	.58	.63	.18	
B-1-13	1286	46	1240	60.24	14.95	.24	.55	.68	.14	
B-1-14	1298	43	1255	60.94	14.97	.23	.52	.59	.13	
B-1-15	1358	42	1316	60.87	14.82	.19	.56	.60	.11	
B-1-16	1308	40	1268	60.91	14.88	.24	.57	.61	.10	
B-1-17	1232	46	1186	60.73	15.01	.27	.51	.63	.14	
B-1-18	1320	46	1274	60.41	15.10	.20	.55	.58	.13	
B-1-19	1296	44	1252	60.27	15.03	.23	.53	.57	.14	
B-1-20	1332	48	1284	60.95	14.90	.24	.51	.55	.13	
B-1-21	1290	44	1246	60.34	14.88	.28	.50	.59	.14	
B-1-22	1350	46	1304	60.41	14.85	.30	.56	.58	.12	
B-1-23	1298	43	1255	60.07	14.95	.27	.55	.56	.1	
B-1-24	1282	46	1236	60.31	15.15	.29	.51	.57	.1	
B-1-25	1308	40	1268	60.86	15.21	.24	.50	.60	.1	
B-1-26	1364	44	1320	59.97	14.78	.25	.56	.61	•	
B-1-27	1338	42	1296	60.41	14.88	.23	.54	.59	•	
B-1-28	1296	44	1252	60.32	14.90	.26	.52	.58	•	
B-1-29	1332	40	1292	60.27	14.88	.20	.54	.63	•	
B-1-30	1350	45	1305	60.34	14.95	.20	.58	.59		
B-1-31	1286	40	1246	60.49	15.21	.19	.50	.55		
B-1-32	1298	45	1253	60.24	14.88	.23	.51	.60		

(Continued on Page 2)

* Spectrographic Analysis

Analyzed by

We certify this is a true and accurate analysis.

ALLOY METAL PRODUCTS, INC.

Checked by

Signed

STATE OF IOWA
COUNTY OF SCOTT

Subscribed and sworn to before me this 1 day of Mar. 1957

My commission expires July 4 1957

Notary Public

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SEES PROSPEROUS FUTURE FOR MAGNESIUM

Predicts Annual Production of Millions of Tons

By JACK C. MISKE
Associate Editor

MAGNESIUM production and consumption will hit an annual rate of several million tons by 2000 A.D. That's what Dr. R. M. Brick, director of research-metallurgy, Continental Can Co., New York, told more than 500 delegates to the 13th annual convention of the Magnesium Association, in New York, Oct. 17 and 18.

Dr. Brick added that no foreseeable demand could lower availability of the metal seriously. He stated that even if magnesium were to be produced for 100 years at the current rate of steel production, the magnesium content of the oceans would drop only from 0.13 to 0.12 per cent.

Delegates also heard more than a dozen technical papers, including four on casting of magnesium.

Automatic Metering of Magnesium Opens Cold Chamber Die Casting Applications and Markets, by F. C. Bennett, metallurgical laboratories, Dow Chemical Co., Midland, Mich.—An automatic metering mechanism has been perfected to supply molten magnesium to cold chamber diecasting machines, and casting rates have been increased to the limit of the cooling capacity of the dies. Molten magnesium alloy is charged to the gas or electrically heated steel holding pot. Metal is protected from oxidation by a conventional flux or by a sulfur dioxide atmosphere. Magnesium from within the pot flows by gravity through a heated transfer pipe leading to a valve above the shot well on the machine.

Magnesium seeks the same head in the valve standpipe as is maintained in the holding pot. The free surface of metal in the standpipe and the atmosphere adjacent to the valve outlet are purged with sulfur dioxide to inhibit oxidation.

Discharge of metal for each cast is controlled by an electrical sequence wired into the machine circuit. When the operator presses the die-close button, the machine closes the die, and the automatic feed is energized to raise the metal valve stem for a timed interval to release a constant weight of metal. The machine shot plunger injects the metal into the die cavity, and the machine opens and ejects the casting.

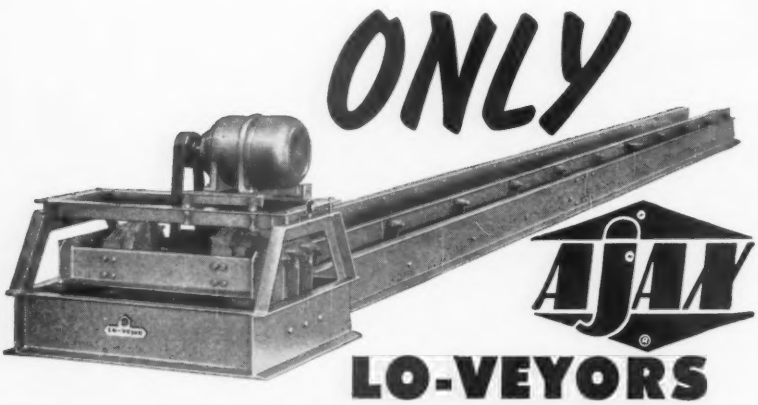
Magnesium Precision Castings Open New Production Potential, by L. H. McCreery, supervisor, engineering structures materials, Chance-Vought Aircraft Inc., Dallas—Working together, engineers of Osbrink Mfg. Co., Los Angeles, and of Chance-Vought have demonstrated the practicability of a magnesium precision sand casting process and have pioneered the development of thin-walled, lightweight cast components. Typical of such parts is the missile outer wing panel described in FOUNDRY, **September, 1956, p. 134.** Casting drawings now are specifying thickness and lineal dimensional tolerances of 1/64 in. or less, draft angle of 0 to 1 degree, and metal thickness of 0.1 in. or less. These castings weigh as much as 165 lb, are as much as 11 ft long, and have metal thickness varying from 3/16 in. or less to 2 in.

Such large and/or precision castings are replacing builtup assemblies, each component of which might have required some degree of repair. Expensive as they are in themselves, the missile wing panel, for example, is estimated conservatively to have saved more than $3500 per missile. Savings also are made in paperwork, reduced need for floor space, and other important areas. It has been discovered that as section thickness is reduced, mechanical properties increase.

Important Aspects in the Control of Quality of Magnesium Castings, by P. A. Fisher, deputy chief metallurgist, Magnesium Elektron Ltd., Manchester, England — Mr. Fisher's paper covered sand and permanent mold castings and dealt with three aspects of the control of metallurgical quality: 1. Practical steps directed to the attainment of high quality. 2. Routine inspection of castings. 3. Determination of the origin of defects so that remedial action can be taken.

Magnesium alloys raise problems of special interest in the casting field because of their high chemical reactivity, low density, low volume heat capacity, general fine grain size, and tendency in some instances to microporosity. Many of these are not simply foundry problems, and it is necessary to consider the control of such aspects of founding as influence the metallurgical quality of castings.

Cored Passages Open New Appli-



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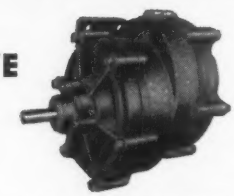
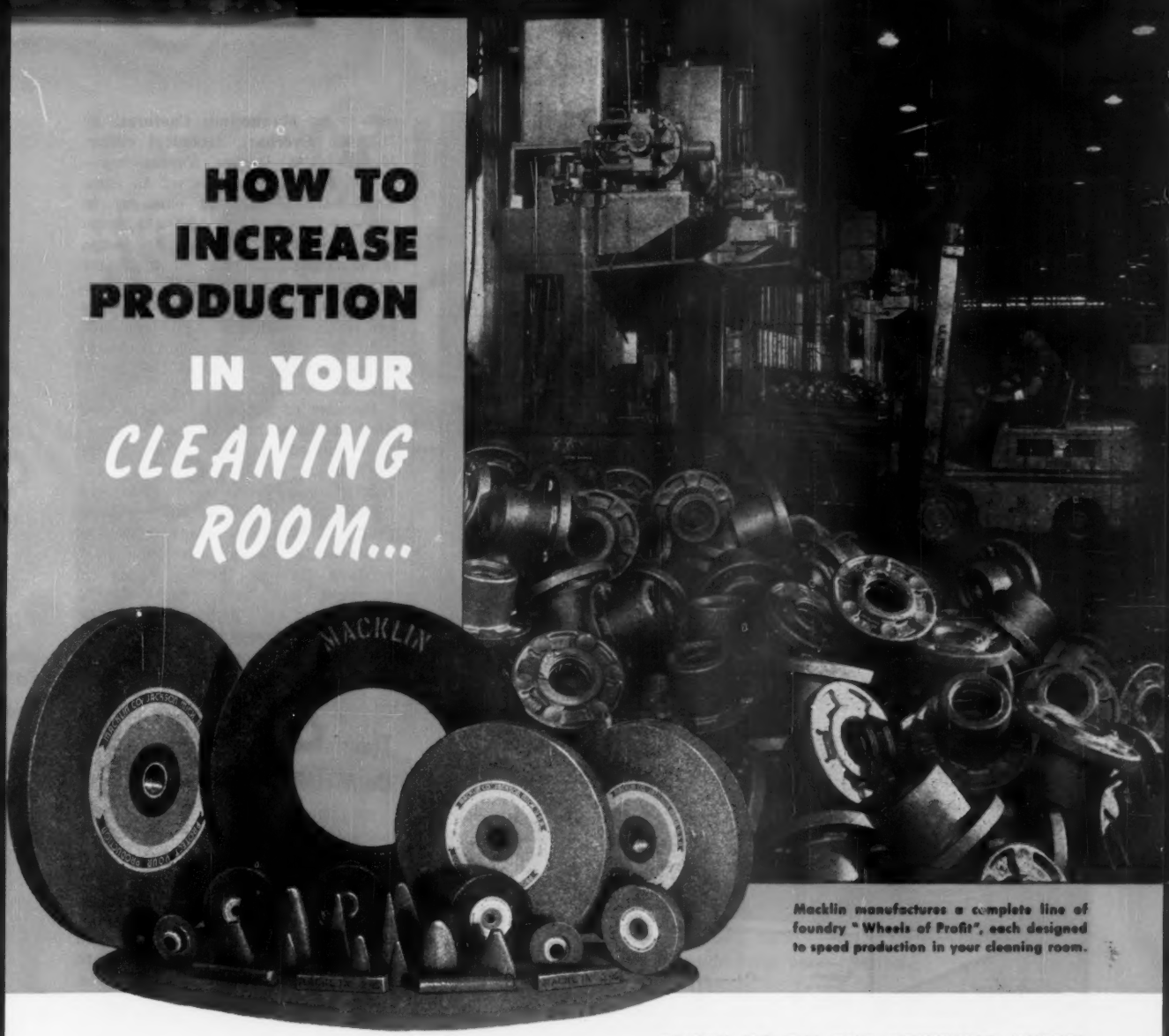
Ajax Lo-Veyor performance is built around its exclusive reciprocating drive. It is a self-contained unit housing two gear driven weights rotating in opposite directions, which impart reciprocating action in automatic balance. The drive mechanism runs on anti-friction bearings in an oil tight housing — which keeps lubrication in and abrasive dirt out. Lo-Veyors are available in open and closed pan or tubular types. Write for catalog.



Showing Ajax Reciprocating Drive Unit. Smooth operation permits installation without heavy anchorage to building.

AJAX FLEXIBLE COUPLING CO. INC.
WESTFIELD, N. Y.

HOW TO INCREASE PRODUCTION IN YOUR *CLEANING ROOM...*



Macklin manufactures a complete line of foundry "Wheels of Profit", each designed to speed production in your cleaning room.

Don't let your cleaning room be a bottle neck to expanded foundry production! Specify Macklin Foundry Wheels with the improved B-5 bond. Tests prove the B-5 gives up to 30% longer wheel life. It cuts faster and the wheels stay sharp with a minimum of dressing.

HERE'S PROOF OF PERFORMANCE—

OPERATION: Stainless and high-speed steel billets and ingots. (Swing frame, 20 x 2½ x 6")

	Wheel Life	Stock Removal
Macklin	13¾ hrs.	330 lbs.
Wheel A	14 hrs.	220 lbs.

OPERATION: Malleable castings. (Floor stand, 20 x 2 x 10")

	Wheel Life	Stock Ground Over the Wheel
Macklin	24 hrs.	17 tons
Wheel B	18 hrs.	11 tons

OPERATION: 3% Titanium Steel Billets. (Swing frame, 16 x 2 x 6")

	Stock Removal
Macklin	36 lbs. per hr.
Wheel C	18 lbs. per hr.

OPERATION: Gray Iron Castings. (Portable, 6/4 x 2 x ⅛")

	Wheel Life
Macklin	17-20 hrs.
Wheel S	12-15 hrs.

CHECK-UP ON THE GRINDING WHEEL PERFORMANCE IN YOUR FOUNDRY

- Is the rate of production up to your top requirements?
- Are wheels removing the proper amount of metal in relation to the amount of wheel used?
- Do wheels stay sharp and hold proper contour?

YOUR MACKLIN FIELD ENGINEER WILL BE GLAD TO HELP YOU GET THE RIGHT ANSWERS TO THESE QUESTIONS. **To arrange for an on-the-job demonstration, *without obligation*, write today!**

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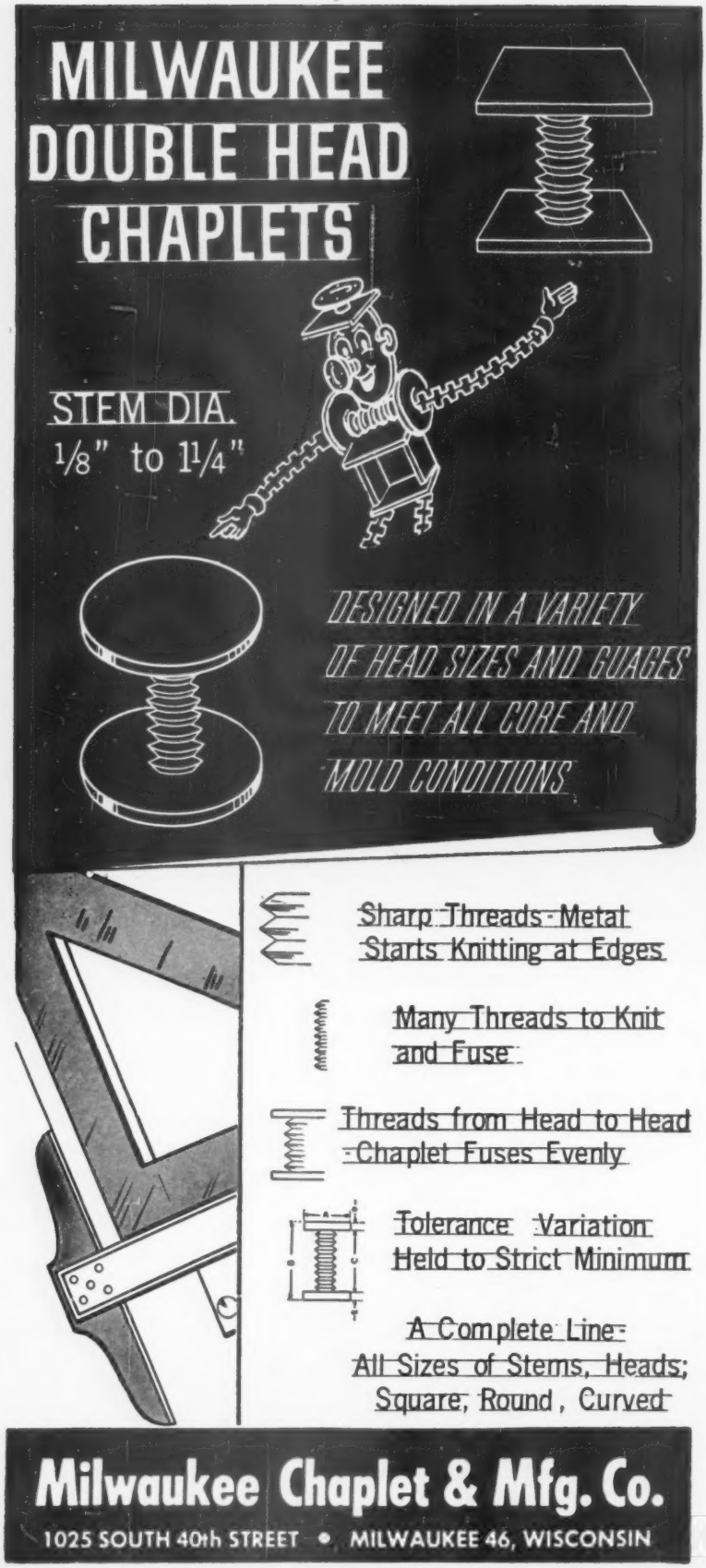
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1/8" to 1 1/4"
DESIGNED IN A VARIETY OF HEAD SIZES AND GUAGES TO MEET ALL CORE AND MOLD CONDITIONS
Sharp Threads-Metal Starts Knitting at Edges
Many Threads to Knit and Fuse
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cations to Magnesium Castings, by John L. Everhart, technical editor, *Materials in Design Engineering*— Methods have been devised to form small-diameter unlined passages in sandcast magnesium and aluminum alloys to permit engineers to design intricate passages with much greater freedom than was possible previously. Complex small-diameter passages can be produced by using tubing that remains in the casting, but there is some disagreement about this lined-passage method.

Because of its limitations, several methods have been devised to produce unlined passages. These involve the use of steel, copper, or glass tubing or siliceous cores that are dissolved after the casting has been produced. Metal or glass cores are dissolved by passing a suitable acid mixture through them. Drilling of passages has been practiced for many years and for simple passages is the least expensive method; but it has obvious disadvantages compared with the unlined-passage method.

Translates Russian Articles On Metallurgical Research

The Metallurgist, the Soviet journal said to cover all aspects of metallurgical research in the USSR, now is available in complete English translation from Consultants Bureau, 227 West 17th St., New York 11, N. Y. All material is translated cover to cover, and translations are staple-bound and include all diagrams, photographs, and tabular material integral with the text.

Yearly subscription rate (12 issues) is $95. Single issues are $20 each, and single articles are $7.50. Translation began with the 1957 volume.

Book Review

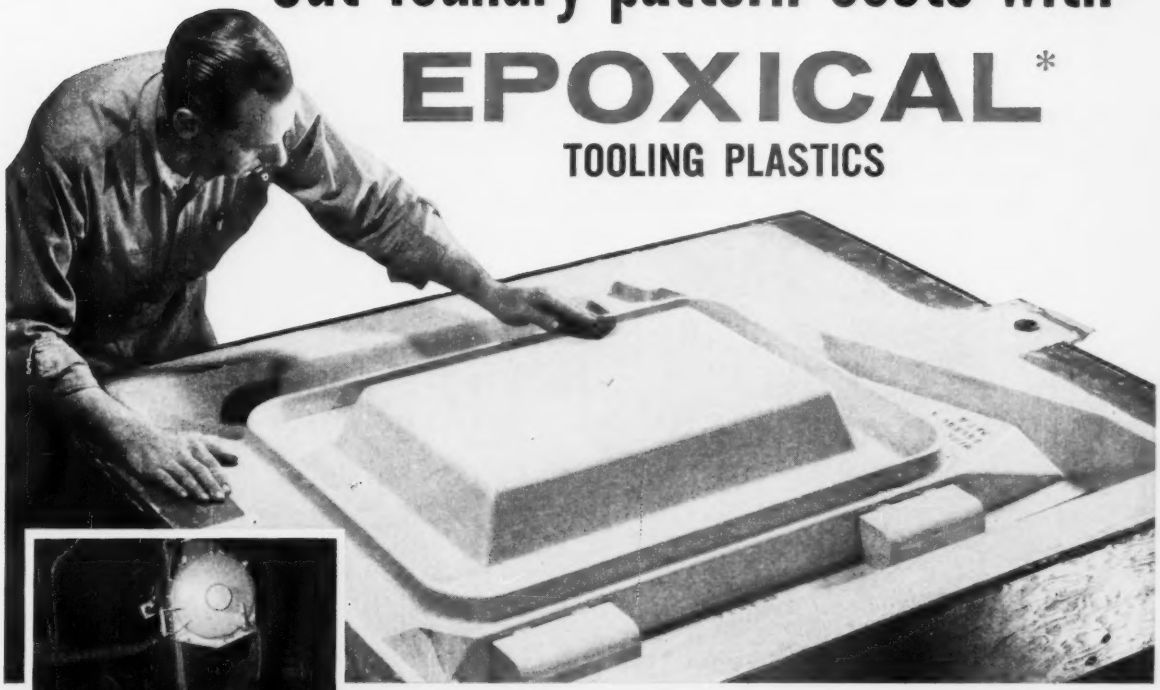
Materials Handling Equipment, by D. Oliphant Haynes, 636 pages, published by Chilton Co., Book Division, 56th & Chestnut Sts., Philadelphia 39, Pa. Price $17.50.

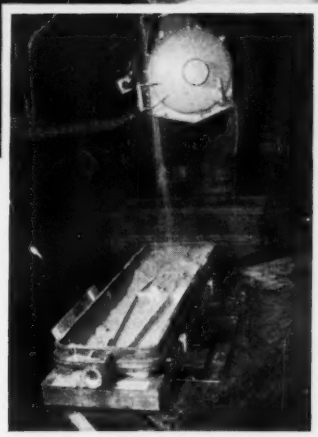
Comprehensive book portrays the story of machines and systems, what they do and how they do it. Seven sections cover transporting, conveying, elevating, transferring, self-loading, bulk handling and accessory equipment. Basic types of equipment and their capabilities, unit load handling, in process handling, integration of production machinery with handling equipment, package handling, techniques for analyzing specific problems, analysis and design of handling systems, cost analysis, and organization and control of handling systems are covered in detail.

Circle 694 on Page 51

Cut foundry pattern costs with EPOXICAL*

TOOLING PLASTICS





Durable EPOXICAL resins for strong sand slinger patterns

Exceptionally wear-resistant, EPOXICAL resins may be used for strong, durable slinger patterns. Production foundries are turning to these U.S.G. formulated epoxy resins for faster pattern fabrication at lower cost.

Fabrication time cut for Taccone machine equipment

Only one week was needed to complete this laminated EPOXICAL pattern. Four to five weeks would have been required to make a comparable metal pattern. The plastic drag half was made from a single-shrink experimental wood pattern—for a metal pattern a new double-shrink pattern would have been needed.

Plastic cope and drag replaces worn-out wood patterns

This set of cope and drag equipment was cast in an ULTRACAL* gypsum mold. First, the original worn-out patterns were repaired with wax. Next, an ULTRACAL mold was cast over the patterns by the splash cast technique. The molds were lacquered, parting compound applied, and EPOXICAL resins poured.

*ULTRACAL is a trade mark Reg. U.S. Pat. Off. for super-strength gypsum cement manufactured by United States Gypsum Company. EPOXICAL is a trade mark for epoxy resins manufactured by United States Gypsum Company.

UNITED STATES GYPSUM

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SEND FOR COMPLETE INFORMATION TODAY

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Gentlemen:

I want more information about EPOXICAL tooling plastics. Please send a trained U.S.G. Industrial Representative to demonstrate EPOXICAL in my plant.

NAME_____

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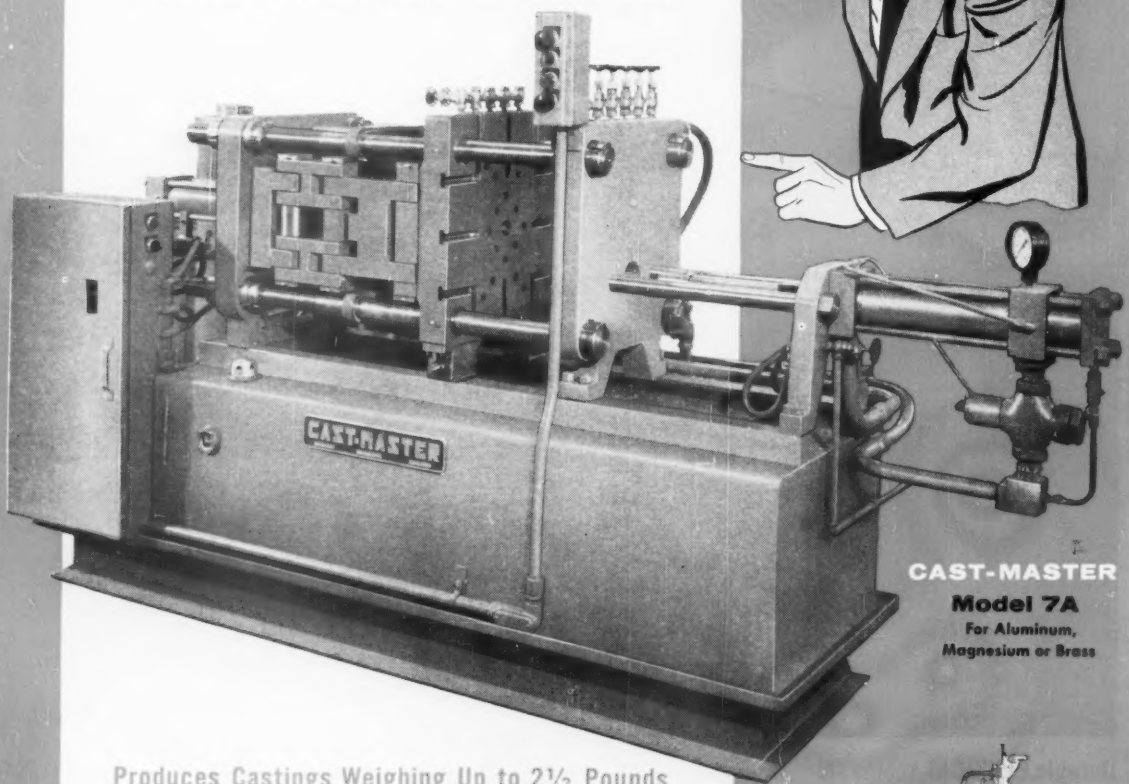
CITY_____ ZONE____ STATE_____

Circle 695 on Page 51

DELIVERY FROM STOCK

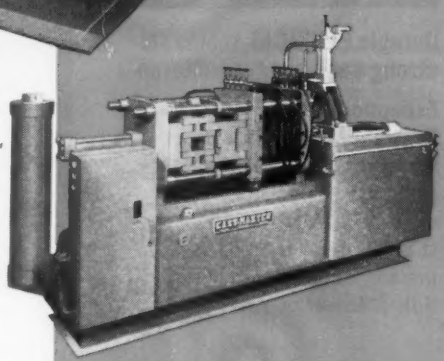
Available in Both ZINC and ALUMINUM Models



CAST-MASTER
Model 7A
For Aluminum, Magnesium or Brass

Produces Castings Weighing Up to 2½ Pounds

Great news for producers of small castings! Now you can get *quick, direct-from-stock delivery* on two new Cast-Master Die Casting Machines: Model 7Z for Zinc, Tin, Lead — Model 7A for Aluminum, Magnesium, Brass. Both feature the same outstanding design and rugged construction of the larger models now operating in America's leading plants. That means solid steel platens, extra heavy linkage with multiple shear points, and many other details that make possible safer, high-speed production of mirror-smooth, hardware-finish castings.



CAST-MASTER
Model 7Z
For Zinc, Tin and Lead

Send For Brochure Giving Full Details And Specifications

Eastern Rep. Milton Harmon, 18 Rock Rd., Milford, Connecticut
Midwest Rep. C. W. Stone Co., Minneapolis, Minnesota
Western Rep. Sydney J. Wills, 2120 Strand, Hermosa Beach, Calif.

CAST-MASTER *Inc.* **23901 AURORA ROAD** BEDFORD, OHIO

Foundry Statistics

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1955	827,162	165,482	298,349	355,203	.....
1956					
Aug.	60,839	13,113	18,067	29,563	109,352
8 mo.	523,315	117,261	165,216	239,911	.....
Sept.	61,942	12,367	17,855	31,649	111,785
Oct.	73,415	14,402	21,120	37,792	110,818
Nov.	69,058	14,346	20,673	33,938	113,356
Dec.	66,951	13,405	20,557	32,940	118,185
Total	794,581	171,181	245,421	376,230	.....
1957					
Jan.	72,999	14,201	20,963	37,194	116,088
Feb.	69,451	13,366	21,707	34,311	107,869
Mar.	74,527	13,914	22,974	37,521	107,963
Apr.	68,284	14,287	20,376	33,493	98,113
May	65,108	12,705	20,708	31,602	94,748
June	58,547	11,585	17,180	29,700	88,086
July	52,173	10,447	16,322	25,339	89,430
Aug.	55,735	10,996	18,398	26,319	89,826
8 mo.	516,824	101,501	158,628	255,479	.....

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	
1955	1,104,775	652,552	.....	.....	.....	.....	.....
1956							
Aug.	74,422	43,479	62,867	36,759	11,555	6,720	91,883
8 mo.	641,891	373,268	552,891	310,526	89,000	50,024	.....
Sept.	69,380	41,902	59,071	35,534	10,309	6,368	92,553
Oct.	81,528	50,219	68,769	43,109	12,759	7,110	92,734
Nov.	82,717	47,979	68,549	40,107	14,168	7,872	89,977
Dec.	76,352	44,268	63,625	37,569	12,727	6,699	92,311
Total	951,868	557,636	812,905	466,845	138,963	78,073	.....
1957							
Jan.	85,977	51,508	71,589	43,401	14,288	8,107	93,886
Feb.	78,028	46,729	65,411	39,590	12,617	7,139	90,725
Mar.	78,013	48,311	64,560	23,915	13,453	7,666	89,431
Apr.	80,271	51,320	65,990	42,810	14,281	8,510	83,116
May	76,504	46,277	63,058	38,072	13,445	8,205	79,787
June	72,556	44,639	59,829	36,892	12,727	7,747	76,331
July	57,748	34,876	45,101	27,290	12,648	7,586	80,494
Aug.	65,426	39,644	55,320	33,781	10,106	5,863	84,876
8 mo.	594,523	363,304	490,958	285,751	103,565	60,723	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1955	1,008,898	905,867	63,111	.....
1956				
Aug.	77,619	70,479	3,805	56,364
8 mo.	675,085	605,639	41,605	.....
Sept.	72,109	64,887	3,930	56,990
Oct.	81,049	73,058	4,104	54,363
Nov.	72,866	65,022	4,114	52,643
Dec.	85,197	57,931	3,769	56,556
Total	966,306	866,545	57,522	.....
1957				
Jan.	82,025	73,202	4,510	57,422
Feb.	72,084	64,346	4,188	54,133
Mar.	77,418	69,258	4,445	49,135
Apr.	77,167	69,141	4,316	48,148
May	75,347	67,251	4,421	46,791
June	70,959	63,910	3,590	44,232
July	60,621	54,847	3,010	44,175
Aug.	71,233	64,953	3,278	40,446
8 mo.	586,854	526,908	31,758	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1955	27,854	25,294	....
1956			
Aug.	3,059	2,860	8,201
8 mo.	23,961	22,203	....
Sept.	3,079	2,863	8,193
Oct.	3,442	3,187	7,893
Nov.	2,892	2,715	7,984
Dec.	2,794	2,612	7,616
Total	36,168	33,580	....
1957			
Jan.	3,207	3,017	8,245
Feb.	2,661	2,473	8,276
Mar.	2,970	2,804	7,690
Apr.	2,896	2,723	7,542
May	2,832	2,706	7,188
June	2,973	2,817	6,765
July	2,544	2,384	6,964
Aug.	2,315	2,150	6,222
8 mo.	22,398	21,074	....

PRODUCTION WORKERS

Estimated Number

	July 1957	June 1957	July 1956
Ferrous	193,200	197,900	203,900
Nonferrous	61,900	63,200	61,800

Average Weekly Earnings

Gray Iron	85.24	85.24	82.41
Malleable Iron	83.85	84.89	81.19
Steel	95.24	96.41	93.66
Nonferrous	91.77	91.88	89.13

Average Weekly Hours

Gray Iron	39.1	39.1	40.2
Malleable Iron	39.0	39.3	39.8
Steel	40.7	41.2	42.0
Nonferrous	39.9	40.3	40.7

Source: Bureau of Labor Statistics.

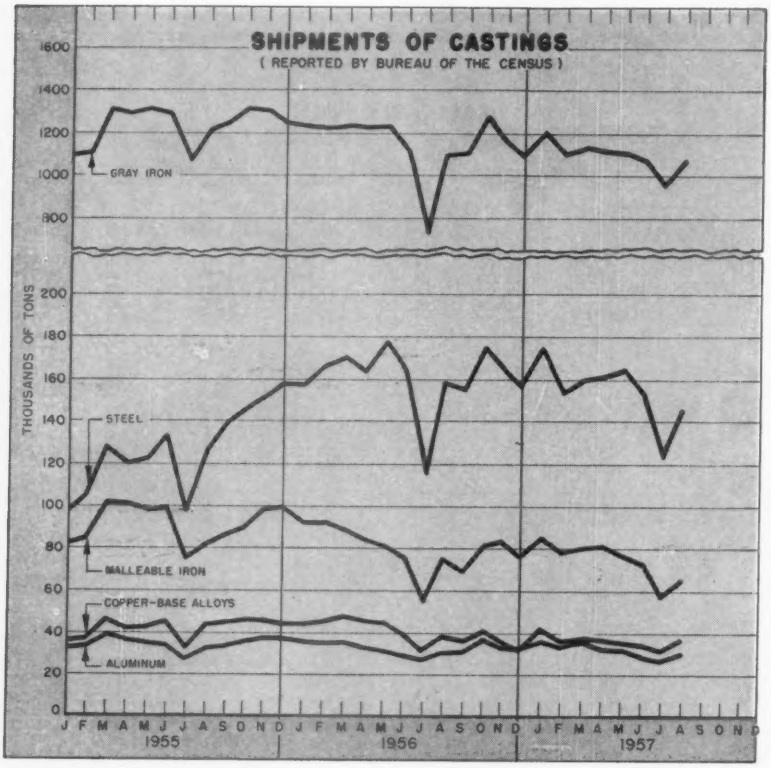
GRAY IRON CASTINGS—SHIPMENTS (Net tons[1])

	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	Total[3]	Total[3]	
1955	14,837,745	7,987,205	9,161,685	3,715,963	2,739,864	1,392,209	385,041	1,681,630	869,558	.....
1956										
Aug.	1,103,195	671,523	639,953	293,673	170,857	89,589	31,712	180,249	80,424	1,074,461
8 mo.	9,191,285	5,358,065	5,490,486	2,451,377	1,632,155	861,613	286,126	1,215,848	566,670	.....
Sept.	1,109,943	648,784	623,743	282,824	233,823	117,708	35,361	151,081	65,935	1,037,283
Oct.	1,274,734	734,384	749,200	331,069	252,203	134,265	30,978	171,377	70,976	996,351
Nov.	1,175,572	634,556	720,263	303,938	251,262	131,321	27,852	116,157	60,038	916,723
Dec.	1,108,993	587,046	681,834	281,527	254,703	136,584	25,874	92,439	54,143	920,034
Total	13,860,527	7,963,135	8,265,526	3,650,735	2,624,146	1,381,490	406,191	1,746,902	817,762	.....
1957										
Jan.	1,213,215	642,317	761,697	320,058	261,961	136,456	31,139	101,069	57,346	904,860
Feb.	1,103,118	582,010	705,585	302,514	230,126	115,525	30,079	89,146	48,182	931,054
Mar.	1,133,146	604,481	713,767	305,104	214,775	98,694	36,995	108,158	59,451	934,847
Apr.	1,120,349	611,443	699,395	298,319	192,199	88,390	36,979	128,710	63,066	899,074
May	1,112,096	625,496	674,460	291,557	192,336	92,659	34,406	141,685	69,709	879,825
June	1,058,464	599,494	630,513	274,115	193,640	94,860	32,087	131,360	70,864	853,012
July	954,102	523,489	565,897	243,187	190,434	86,795	31,209	106,532	60,030	879,976
Aug.	1,075,957	596,779	630,130	265,185	205,655	95,239	28,976	238,209	72,987	825,676
8 mo.	8,770,447	4,785,509	5,381,444	2,300,039	1,681,126	808,618	261,870	1,044,869	501,135	.....

STEEL CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[2]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1955	1,530,694	1,166,706	236,880	1,088,489	814,258	219,602	445,769	354,452	17,278	.....
1956										
Aug.	159,831	127,001	32,965	119,025	94,257	30,601	40,806	32,744	2,364	586,496
8 mo.	1,278,472	1,002,318	238,296	935,075	740,879	192,371	325,397	261,439	15,825	.....
Sept.	155,046	121,705	33,496	116,905	91,266	31,314	38,141	30,439	2,182	562,937
Oct.	175,630	135,798	34,762	132,250	101,961	32,743	43,380	33,837	2,019	558,478
Nov.	164,114	126,900	28,284	122,212	93,262	26,436	41,902	33,638	1,848	545,862
Dec.	158,725	125,569	34,080	120,326	94,741	32,227	38,399	30,828	1,853	521,782
Total	1,931,987	1,512,290	368,918	1,444,768	1,122,109	345,091	487,219	390,181	23,827	.....
1957										
Jan.	169,240	133,826	30,090	125,389	98,533	27,739	43,851	35,293	2,351	519,575
Feb.	154,932	121,667	27,181	114,805	89,480	25,060	40,127	32,187	2,121	511,806
Mar.	160,054	124,416	29,968	121,089	93,466	27,683	38,965	30,950	2,285	503,407
Apr.	162,498	124,549	29,708	122,894	93,512	27,624	39,604	32,037	2,084	497,632
May	164,575	125,431	32,840	124,840	94,635	30,926	39,735	30,796	1,914	504,990
June	153,647	119,353	31,338	116,759	91,009	28,766	36,888	28,344	2,572	494,267
July	122,018	90,037	22,803	91,730	67,719	21,426	30,288	22,318	1,377	489,390
Aug.	145,926	111,080	33,641	113,167	86,407	31,639	32,759	24,673	2,002	471,190
8 mo.	1,232,890	950,359	237,569	930,673	714,761	220,863	302,217	236,598	16,706	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.


SHIPMENTS OF CASTINGS
(REPORTED BY BUREAU OF THE CENSUS)
THOUSANDS OF TONS
GRAY IRON
STEEL
MALLEABLE IRON
COPPER-BASE ALLOYS
ALUMINUM
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1955
1956
1957

COKE PRODUCTION AND CONSUMPTION

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1955 ...	75,150,247	76,266,385	3,154,052
1956			
Aug. ...	5,614,997	5,281,627	225,978
8 mo..	47,798,453	45,752,177	1,927,138
Sept. ...	6,453,229	6,609,309	211,015
Oct. ...	6,742,483	6,951,386	253,147
Nov. ...	6,328,272	6,681,074	237,330
Dec. ...	6,615,935	6,959,900	224,452
Total .	73,938,372	72,953,846	2,853,082
1957			
Jan. ...	6,857,640	7,096,024	241,014
Feb. ...	6,211,845	6,302,583	228,569
Mar. ...	6,894,121	6,803,311	232,266
Apr. ...	6,436,273	6,396,900	226,698
May ...	6,632,519	6,521,817	219,675
June ...	6,362,335	6,318,339	188,487
July ...	6,501,266	5,888,057	180,014
Aug. ...	6,515,258	5,878,013	204,870
8 mo..	52,411,257	51,205,074	1,721,593

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1956	1957
Jan.	27,736	25,681
Feb.	24,949	20,769
Mar.	28,310	21,948
Apr.	25,808	23,507
May	23,437	22,037
June	18,842	18,888
July	17,364	16,695
Aug.	23,812	19,654
Sept.	20,929	19,670
Oct.	23,045	.....
Nov.	21,818	.....
Dec.	18,046	.....
Total for year	274,096	.....

Source: Defense Council of the Ingot Brass and Bronze Industry.

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1955	778,000	493,244	.....
1956			
Aug.	52,793	33,753	73,411
8 mo. ..	456,970	295,913	.....
Sept.	46,811	34,438	79,390
Oct.	65,921	42,414	75,706
Nov.	65,443	40,189	74,623
Dec.	58,583	36,562	75,293
Total ..	693,728	449,516	.....
1957			
Jan.	67,964	42,189	75,503
Feb.	59,793	36,580	74,739
Mar.	61,378	40,593	64,466
Apr.	54,982	34,801	59,534
May	53,565	35,676	66,712
June	49,356	33,206	64,137
July	48,379	29,418	64,043
Aug.	49,829	34,040	64,789
8 mo. ..	445,246	286,503	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1956	1957
Jan.	195.6	117.9
Feb.	169.0	188.4
Mar.	152.7	127.0
Apr.	135.2	101.1
May	207.0	136.2
June	156.7	187.5
July	110.3	98.6
Aug.	188.3	231.3
Sept.	114.7	....
Oct.	122.2	....
Nov.	121.0	....
Dec.	115.6	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent monthly average. This is a new base period. Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

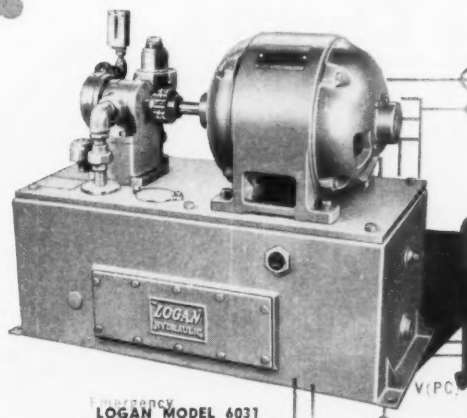
(Gross tons*)

	All Scrap Total	By Types of Furnace: Cupola Total	Air Total	Electric Total
1955	72,654,925	10,786,957	1,273,470	8,757,593
1956				
July	1,986,613	621,064	56,071	399,441
7 mo. ...	40,731,323	5,840,089	676,778	5,551,671
Aug.	5,453,927	803,123	92,200	807,131
Sept.	6,231,017	738,824	84,627	841,783
Oct.	6,722,320	890,389	101,773	935,008
Nov.	6,305,947	822,542	95,890	875,524
Dec.	6,264,955	722,320	82,160	851,770
Total	71,709,489	9,817,287	1,133,128	9,862,887
1957				
Jan.	6,630,804	874,764	102,782	927,499
Feb.	6,038,436	804,185	93,902	834,843
Mar.	6,294,038	814,372	92,534	903,149
Apr.	5,816,309	835,027	97,289	807,922
May	5,753,435	812,141	92,260	786,210
June	5,430,607	744,790	80,063	705,590
July	4,897,752	652,773	68,504	629,395
7 mo. ...	40,881,381	5,538,052	627,334	5,594,608

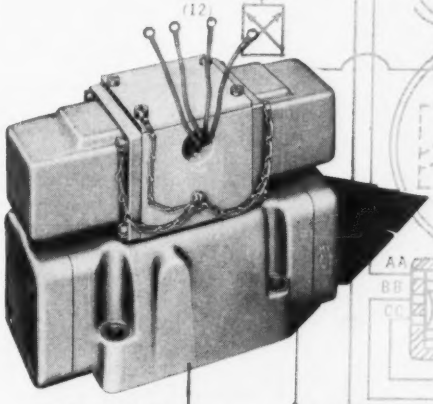
PIG IRON PRODUCTION AND CONSUMPTION

	Production** (Standard grades—net tons): Total	Foundry	Malleable & Silvery	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons): Total	Cupola	Air	Electric
1955	77,114,073	2,858,957	3,884,971	62,570,394	7,799,751	68,944,698	5,326,534	260,008	246,406
1956									
Sept.	6,873,352	236,809	316,590	5,636,288	683,665	4,618,718	404,948	22,719	17,604
9 mo. ..	53,794,955	1,867,077	2,734,844	44,018,011	5,225,023	41,830,061	3,214,726	178,397	135,922
Oct.	7,246,650	245,762	321,188	6,001,279	678,421	6,053,147	366,848	19,642	18,239
Nov.	6,977,457	140,277	354,573	5,831,885	664,051	6,450,404	446,449	22,548	19,064
Dec.	7,268,743	149,745	322,631	6,099,101	697,266	6,237,538	391,632	21,557	17,161
Total ...	75,301,134	2,402,861	3,733,258	61,900,276	7,264,761	60,571,150	4,419,655	242,144	190,386
1957									
Jan.	7,209,547	135,608	344,073	6,081,137	648,699	6,482,472	423,660	22,989	20,431
Feb.	6,596,133	154,543	294,491	5,414,732	730,794	5,860,099	369,206	20,743	19,443
Mar.	7,179,100	168,650	347,451	6,008,135	654,864	6,155,334	370,915	20,241	23,259
Apr.	6,810,102	162,023	329,180	5,686,507	632,392	5,586,587	369,359	20,495	19,756
May	6,877,052	258,638	313,583	5,720,212	584,619	5,862,966	362,085	19,201	17,869
June	6,593,326	243,789	318,906	5,436,203	594,428	5,672,086	335,574	17,044	17,744
July	6,625,901	221,929	336,590	5,515,736	551,646	.....	.....	.....	.....
Aug.	6,719,763	228,378	298,269	5,451,691	741,425	.....	.....	.....	.....
Sept.	6,569,074	218,297	292,244	5,272,056	786,477	.....	.....	.....	.....
9 mo. ..	61,178,395	1,791,855	2,874,787	50,586,409	5,925,344	.....	.....	.....	.....

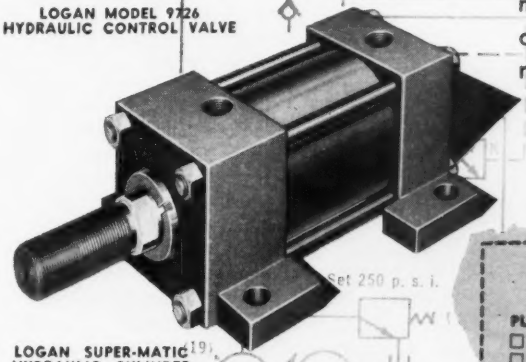
*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For Sale only.



LOGAN MODEL 6031
HYDRAULIC POWER UNIT



LOGAN MODEL 9726
HYDRAULIC CONTROL VALVE



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HYDRAULIC CYLINDER

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FOR POSITIVE, CONTROLLED

POWER

For the simplest or the most complex circuit design . . . Look to Logan. Your one-source manufacturer of dependable hydraulic components to meet your particular need. The assistance of Logan's capable engineering staff is at your service to help you design the circuits to most effectively meet your production problems.

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LOGANSPORT MACHINE CO., INC.
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- ☐ 100-3 AIR-DRAULIC CYLS.
- ☐ 100-4 AIR VALVES
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- ☐ 62 SURE-FLOW PUMPS
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FREE! *Send for the "Logan Calculator"*

Properly designed, properly equipped by Logan.

Circle 697 on Page 51

Around the Country

NEWS REPORTS FROM

Philadelphia . . . Chicago . . . Pittsburgh . . . Boston

Boston— Foundries generally will start 1958 with small backlogs. Producers of steel castings have forward bookings for an average of two months, but gray iron and malleable shops are operating hand-to-mouth.

This year's melt will be approximately 20 per cent under 1956. Decline in machine tool operations is a major factor, also failure of textile equipment integrated shops to increase their melt commensurate with heavier capacity brought about by mechanization.

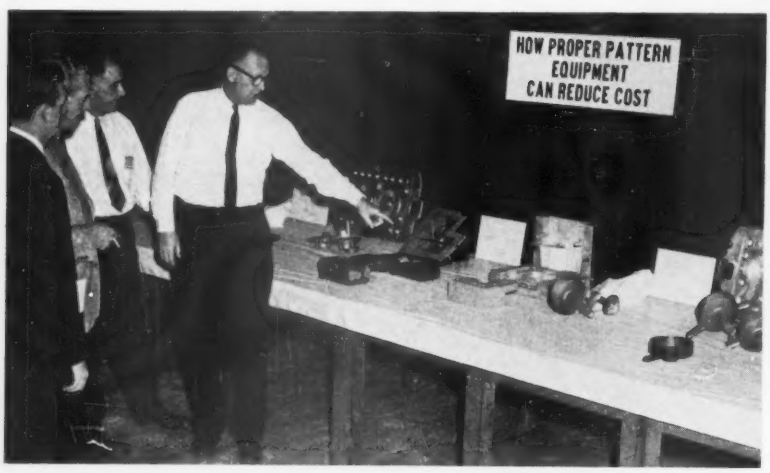
Steel and nonferrous valve production is somewhat above the district average; earnings of one large steel valve producer are about equal to those of 1956.

Most mechanized shops now have capacity in excess of current incoming and nearby potential volume. Many are actively bidding for job work. A mild trend continues toward purchase of castings from jobbing shops with suspension of integrated foundry operations. Among medium and small-volume producers, planning for more extensive mechanization has slowed.

Costs have mounted. New England foundries are not getting high enough prices for their castings, primarily because of competitive factors. Since Jan. 1 pig iron has increased $3 a ton—actually $4.25, since the price was raised $1.25 ton in December, 1956, effective in January. Cast scrap prices are lower about an equal amount and steel scrap is considerably lower. But over-all foundry labor costs are up.

End result is that while gray iron and malleable shops have raised prices for castings, the increase is not comparable to higher costs. Notwithstanding raw material cost ratios, relatively few foundries are increasing the ratio of scrap to pig iron in their charges. Raw material inventories are being held down.

Nonferrous shipments of foundry products will also be lower this year, 15-20 per cent for brass and bronze. Here price fluctuations in costs are more erratic than for iron shops. Copper prices are moving contrary to pig iron. Heavy electrical equipment and shipyard tonnage points upward, including manganese bronze wheels and ship propellers.



MARKETING CASTINGS: More than 150 representatives of various industries attended an open house at the foundry of Draper Corp., Hopedale, Mass., on Oct. 8. Guests saw one of the largest and most highly mechanized foundries in the East: The foundry covers 360,000 sq ft and has a daily capacity of almost 400 tons. Draper believes the visit conveyed solid information to casting buyers and improved relations between the company and its customers. View above shows Henry G. Stenberg, foundry superintendent, as he explained how proper pattern and corebox equipment cuts the cost of castings

Pittsburgh— Lack of automotive orders put a crimp in foundry operations in November. Gray iron foundries reported sales were very slack, with companies operating less than five days per week generally. Foundrymen who had expected a pickup in sales to automakers early in the fourth quarter now see no immediate prospect for an improvement in this market. Without a good automotive demand, foundry operations have little chance of gaining in fourth quarter.

Several other markets for castings also are declining. Mill equipment requirements are dropping as expansion projects for this year are completed by most area plants. Need for ingot molds is slowing, following moderate drops in the steel operating rate.

One of the larger foundry equipment manufacturers in Pittsburgh reports a slight upturn in purchases of equipment for repair of existing facilities during recent weeks. That supplier comments that foundrymen are continuing to keep their facilities in good repair, although sales of new equipment for expansion are slow.

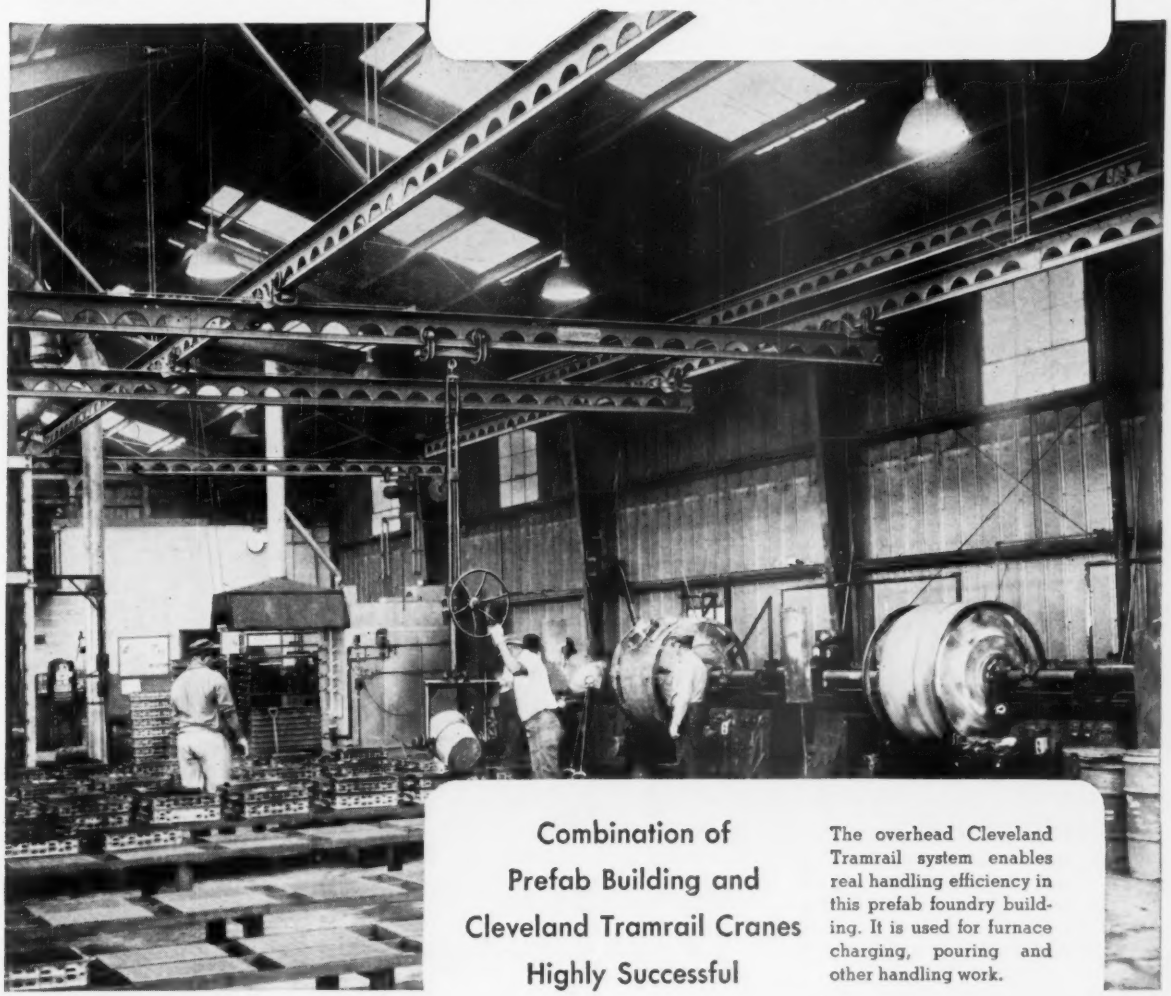
Philadelphia— Casting production is still easing, with no upturn expected until after the turn of the year. In fact, a further dip is anticipated late in December due to yearend seasonal influences.

Currently, most gray iron shops are operating at around 60 per cent of normal capacity or at less than four days a week, with reduced working forces. Backlogs are virtually nil.

Some orders originally scheduled for November have been pushed back to the first of next year.

Papermaking machinery require-

Here's an idea for a **LOW COST EFFICIENT FOUNDRY**



Combination of Prefab Building and Cleveland Tramrail Cranes Highly Successful

The overhead Cleveland Tramrail system enables real handling efficiency in this prefab foundry building. It is used for furnace charging, pouring and other handling work.

THE foundry of Western Automatic Machine Screw Co., Elyria, Ohio, offers a real idea for saving money to anyone contemplating expanding or building a new foundry.

Two prefabricated metal buildings, each 50′ x 160′, joined side by side, are used for the structure. Although the building trusses will support concentrated loads of 6000 lbs. at the middle of the span, the Cleveland Tramrail cranes are of one ton capacity and operate on three runways. There also is Tramrail trackage over the 750 lb. gray iron electric furnaces on which motorized carriers handle buckets of charge materials.

This foundry has proven very successful, both from standpoints of original cost and production efficiency. Cleveland Tramrail's "know-how" in equipping prefab buildings with materials handling equipment has proven of great help in achieving these ends. Of importance, too, is Cleveland Tramrail's method of flexible track suspension which minimizes load concentrations and provides better distribution of stresses.

Western Automatic's foundry, including concrete work, sewer, plumbing, lighting and the Cleveland Tramrail equipment cost far less than for a conventional building, yet it produces efficiently.

As a leader in foundry materials handling equipment, look to Cleveland Tramrail for cost-saving ideas.

FREE BOOKLET: *If you have a prefab or are considering erecting one, this illustrated booklet will be helpful.*
Write for No. 2020A

CLEVELAND TRAMRAIL
Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 3840 E. 286 ST. • WICKLIFFE, OHIO

ments are holding fairly well, but machine tool and textile machinery needs are off definitely and construction equipment requirements are disappointing. Cast pipe lags badly; inquiry all year, in fact, has run behind 1956, due mainly to the drop in housing work.

Steel casting production is off sharply. Earlier in the year the average steel foundry was running well ahead of the average gray iron shop and its backlogs were more extended. Now, however, the rate of steel casting output is about on a parity with gray iron. The drop in capital equipment expenditures is said to have affected steel castings more than gray iron. Backlogs at most steel foundries now run less than two weeks.

Despite a decline in building needs (affecting hardware and plumbing supplies in particular), malleable shops seem to be doing somewhat better than steel and gray iron foundries. Malleable plants in this area are operating at better than four days a week and have more extended backlogs on an average. Business among the nonferrous shops is still spotty.

Chicago— The recent commotion created by Russia's successful launching of earth satellites is underlining the need for the United States to increase its supply of scientific and technological manpower. Qualified observers feel that the Soviet Union's accomplishments in missiles and nuclear energy is attributed in good measure to its emphasis on training engineers.

This is not a new subject to foundrymen. The need for more engineers and technicians in the castings industry is discussed at virtually all foundry conferences, even though it may not be listed on the agenda. For ten years, the Foundry Educational Foundation has been sponsoring a highly successful program in colleges and universities for training foundry engineers, and now it is extending its activities to institutes to train technicians for the industry. During the past year, the American Foundrymen's Society has taken steps to train technical manpower.

Despite all these efforts of the industry itself, progress is slow. Pertinent, therefore, is the contention of Dr. John T. Rettaliata, president, Illinois Institute of Technology, Chicago, that the solution of problems involved in the development of adequate professional personnel will require "greater public recognition of the importance of advancing the technology which sustains our high standard of living and national defense."

Several years of declines in the numbers of scientists and engineers graduated by the colleges and universities have resulted in a "grave" situation which constitutes a threat to the country's security "at a time when there is desperate need that this nation win the race for weapons superiority," Dr. Rettaliata says.

The total graduates in science and engineering, he adds, declined from nearly 110,000 in 1950 to less than 54,000 in 1955. In 1956, he continues, the number of engineering graduates was about 26,000, compared with an estimated need of 40,000 new engineers for industry alone.

"The task of preparing engineers for industry . . . is a responsibility that must be shared by all who are interested in the welfare of our nation—business and industry, taxpayers, educators, political leaders and parents," he says.

Describing the high schools as a great reservoir of potential engineering and scientific talent, Dr. Rettaliata adds: "Recognizing that the effectiveness of modern industry as well as modern weapons depends on an adequate supply of properly educated manpower, we must make a major effort to bridge the gap between high school and college to eliminate or reduce the loss of potential scientific and engineering talent through the failure of large numbers of college-caliber high school graduates to continue their education at the higher level." He suggests increased aid to needy students through scholarships, loan funds, and part-time and summer employment.

605 SAFE DAYS: Employees of East Texas Steel Castings Co., Longview, Tex., completed 365 days without a lost-time injury as of Aug. 13. In addition, nine of the ten plant departments completed 605 accident-free days at the same time. As the illustration above indicates, teamwork of management and employees is credited for this fine record. From left to right are Ross Williams, works superintendent; E. F. Jacobs, safety director; W. F. Leonard Jr., Texas Safety Association; and H. E. Nance, general manager

AIME Names Award Winners For the Coming Year

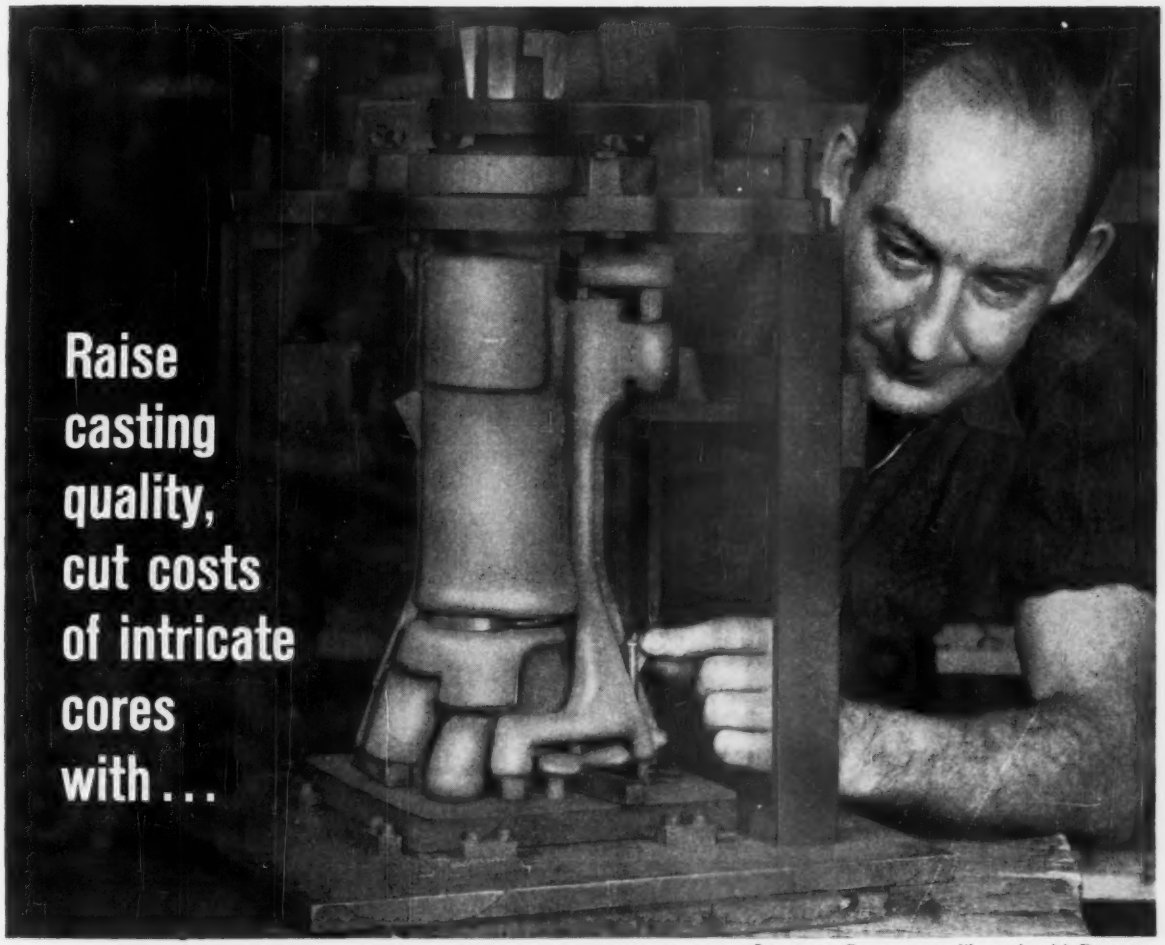
Recipients of two major awards for 1958 have been announced by the American Institute of Mining, Metallurgical, and Petroleum Engineers. The Robert H. Richards Award will go to Fred D. De Vaney, chief metallurgist, Pickands Mather & Co., Duluth, Minn., for achievement that furthers the art of minerals beneficiation. The Benjamin F. Fairless Award will be given to Hjalmar W. Johnson, vice president, steel manufacturing, Inland Steel Co., Chicago, for his intense interest in the technology and development of the iron and steel industry. Presentations will be made at the society's annual banquet, Feb. 20, 1958, in New York.

Book Review

Ductile Chromium, by 49 authorities, 6 x 9 in., 376 pages, published by American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. Price $7.50.

Illustrated volume presents the proceedings of a 1955 conference on ductile chromium and is a factual account of the significant work on the extraction, fabrication and properties of a metal that is a promising base for new alloys of superior oxidation resistance and strength at elevated temperatures.

Five sections in the book cover these subjects: General review of research on chromium, production of chromium metal, ductile chromium metals, effect of gas on chromium, and high-chromium alloys.



INTRICATE CORES are readily made with DEXOCOR sand mixes. This one, being assembled in pasting frame, is typical of the complex high-precision cores produced in this foundry.

DEXOCOR® BINDER

High standards of precision at every step of production are a must in this foundry—where cast parts must be finished to tolerances measured in light bands! No wonder they changed to Dexocor, now use this amazing new binder for 19 different core sand mixes!

Exceptionally important is the marked improvement in casting quality achieved with DEXOCOR. Increased hot strength of cores combined with better collapsibility helps minimize veining and finning—interiors are now smooth, free of sand scabs and readily finished with minimum grinding.

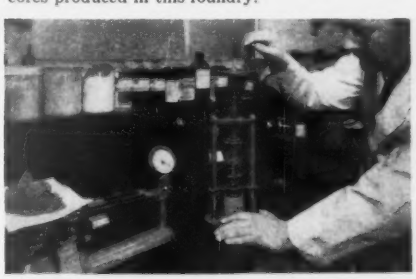
Also important is a saving of up to 50% in bake time—DEXOCOR cores are better cured after one pass through oven than former cores were after two!

Other advantages resulting from use of DEXOCOR include faster mulling, and ready control of blowability, green properties, release characteristics and baked strength.

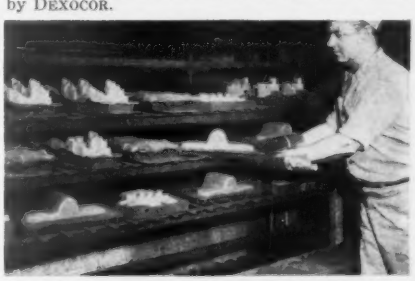
If you are not already using DEXOCOR get detailed information—and technical help in adapting this unique new binder to your needs. Contact our nearest sales office or write:

CORN PRODUCTS SALES COMPANY
17 Battery Place, New York 4, N. Y.

DEXOCOR® *is the perfect teammate for* MOGUL® *and* KORDEX® *binders and* GLOBE® *dextrines*



EXCELLENT GREEN PROPERTIES, including greater cohesiveness, rigidity and sag resistance for cores with high stand or overhang, are imparted to cores by DEXOCOR.



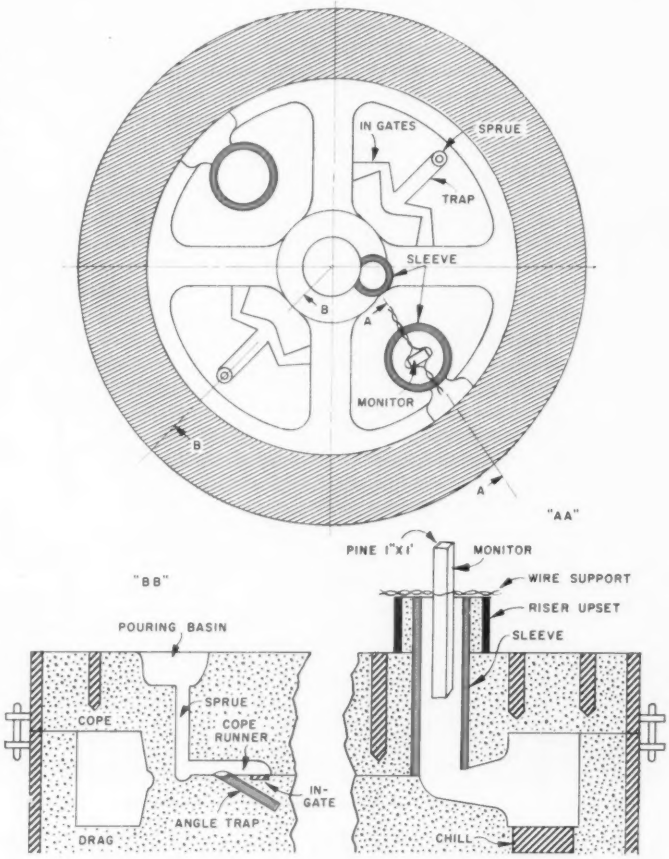
BAKED CORES made with DEXOCOR sand mixes withstand heat and pressure of hot metal, yet readily shake out, leaving clean, smooth interior surfaces in castings.

Circle 699 on Page 51

Trouble Shooting

By C. W. AMMEN

Top right—View from above of feeding system for bull gear blank. Below it are cross-sectional views of the molding setup showing location of the various components of the mold



CASTING A BULL GEAR

Dear Charlie:

From time to time, we are called on to produce the castings for what are called workboat steering engines —you know, two "A" frames, a pinion, a wildcat, and a bull gear. Frames, pinion, and bull are made of tin bronze, and the wildcat is in manganese bronze. Everything is fine, except that the bull gear has a heavy rim with respect to spokes and hub. It is risered on the outside at each of the four spokes, gated into each riser, and poured two up.

When the teeth are cut, the user runs into an open grain and shrink or draw where the risers were attached to the face. Sometimes the defect is just big enough to spoil the gear. If the defect occurred on the inside of the rim, a little patching would be O. K. The customer doesn't mind a bit of shrink as long as it doesn't fall where the teeth are cut.

Sincerely,
Charlie

Dear Sam:

Bull gear blanks with poorly proportioned spoke-to-rim designs have plagued foundrymen for a long time and probably will do so for some time to come. I nearly went nuts one time with one which had to be **100 per cent shrinkfree—every one** x-rayed. On this one, the spokes were so light that they pulled away at the hub and the rim.

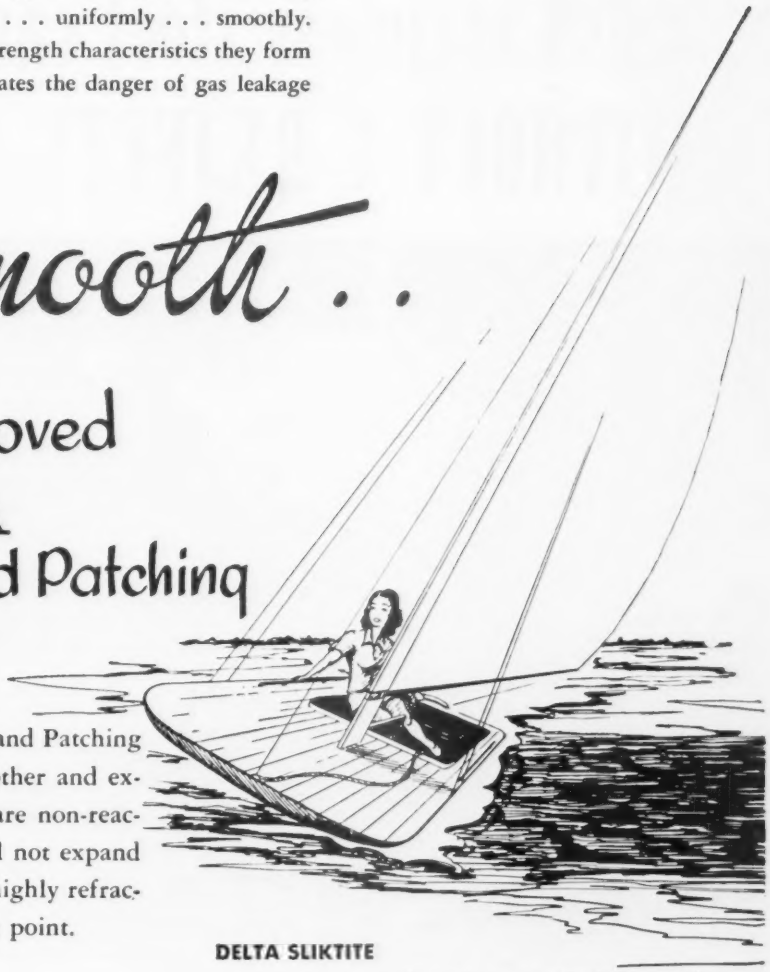
Although the risers are much easier to remove when placed on top of the rim or on the OD, as you are doing, it is not considered good practice to locate a riser on the face of a gear blank when such placement can be avoided. Risers should be placed on the inner face of the rim, between the spokes, and padded to prevent them from freezing at the point of attachment.

This bull gear must have a heavy face, for as a rule tin bronze alloys are not too difficult to feed. If I had this bull gear to make, I would use the system of feeding whereby the sprue is stopped off when metal in the risers reaches a height of about 4 in. above the highest point of the casting. Hot metal then is poured into the heads and covered with some dry charcoal or ground-up gypsum sleeve. The pattern is placed on a molding board, and chills are placed around the face of the rim and hub;

Delta Mudding and Patching Compounds are used to eliminate fins at core joints and to repair core imperfections. They are easy to apply . . . quickly . . . uniformly . . . smoothly. Due to their high hot and dry strength characteristics they form a complete bond which eliminates the danger of gas leakage at core joints.

Smooth . .

New...Improved **DELTA** Mudding and Patching Compounds



The new DELTA Mudding and Patching Compounds are faster, smoother and extremely easy to use. They are non-reactive with molten metal, will not expand or contract when dried, are highly refractory and have a high fusion point.

DELTA SLIKTITE

is a clean, smooth, ready to use plastic-type Mudding and Patching Compound for use on cores in the production of steel, gray iron, malleable and non-ferrous castings.

DELTA EBONY

is a smooth, black, ready to use plastic-type Mudding and Patching Compound for use on cores in the production of gray iron, malleable and non-ferrous castings.

Ask for working samples of the new, improved Delta Mudding and Patching Compounds. Be sure to specify SLIKTITE or EBONY. You will also receive complete instructions for use.

DELTA

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

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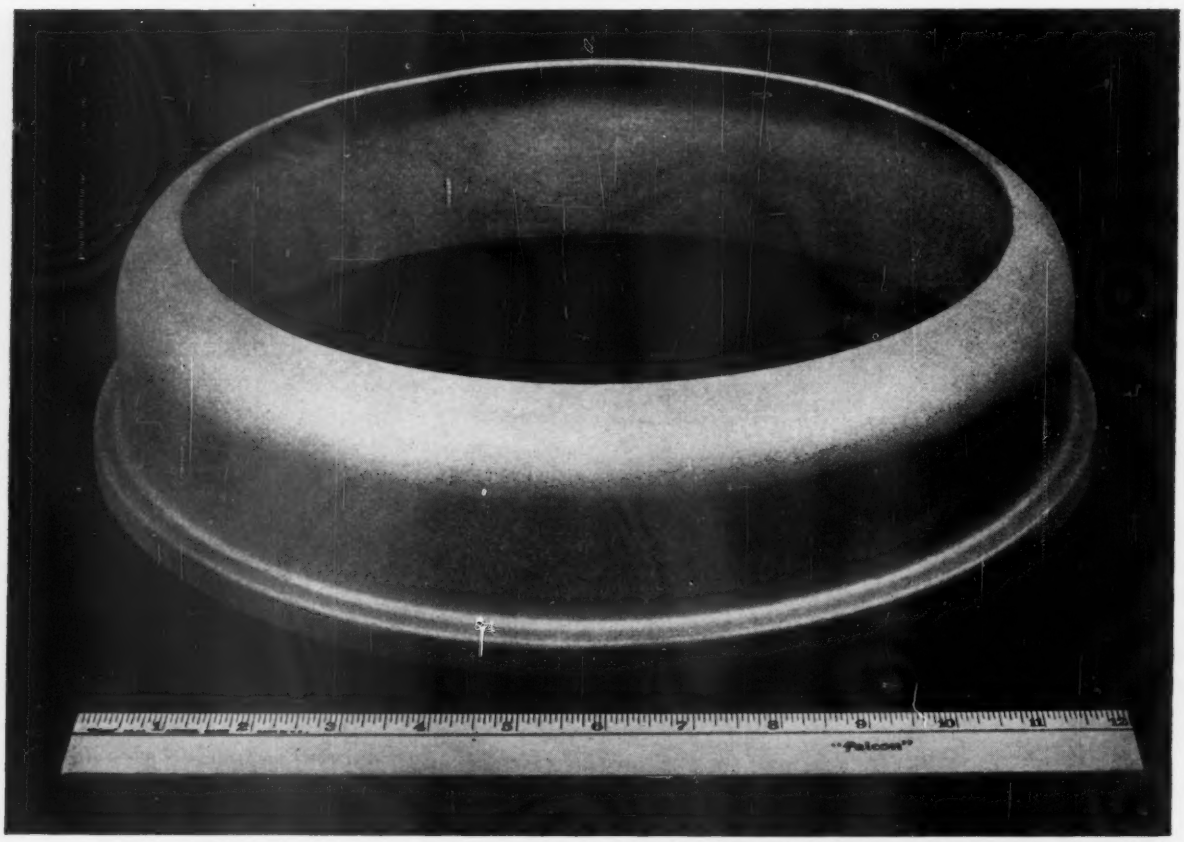
Circle 700 on Page 51

Made with a BAKELITE shell molding resin...

TRADEMARK

3,089 stainless steel castings WITHOUT A REJECT!



Casting produced by Pacific Alloy Engineering Corp., San Diego, Calif.

ECONOMY AND QUALITY sum up the results of casting this stainless steel part in a shell mold made with BAKELITE Brand Phenolic Resin BRP-5011.

Its thirteen-inch diameter was held to a tolerance of ± .015 inches, and the finish was 125 RMS or better. In a five-month period, the foundry manufactured 3,089 of these castings for The Martin Company without one reject.

BRP-5011 is just one of a variety of shell molding resins produced by Bakelite Company. As a result, you have considerable choice in selecting the formulation that fits your needs best.

And you can call on the experience and technical assistance of Bakelite Company, pioneer in the manufacture of shell molding resins in this country. For more information, write Dept. ZN-71.

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BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.

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the drag is faced and rammed in the usual manner, then vented. A good, stout bottom board is rubbed into place, clamped and rolled over, and placed on a level bed or on rails.

Place two suitable gypsum sleeves between the spokes, across from each other and near the inner face of the rim. Also place two sprue sticks near the rim. Cut and fit a sleeve to the hub, and ram up the cope in the usual manner. From the two sprues, runners are cut in the cope toward the hub. Ingates are cut across in the drag, into the spokes on an angle, to make the first metal back in.

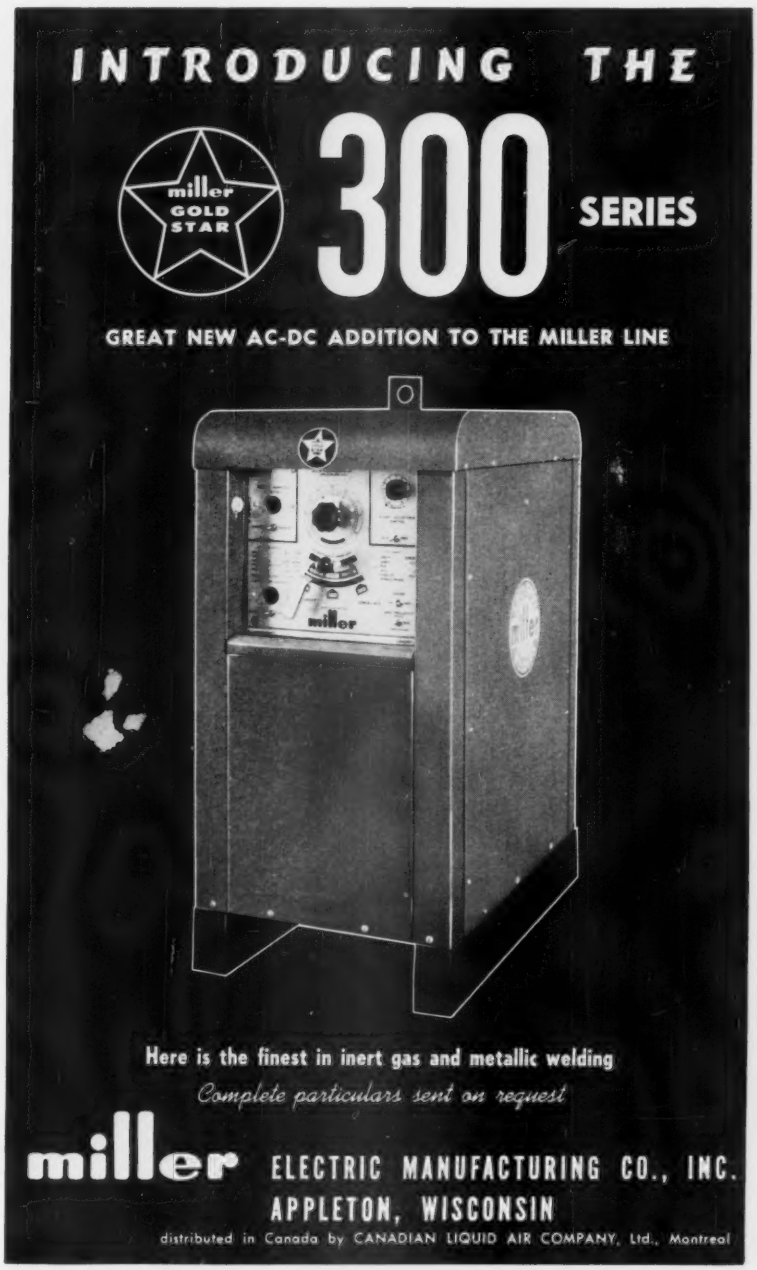
A few inches away from the down sprues, toward the hub, with a sprue cutter cut down into the drag on an angle. Go in about 6 in. or so, forming an angle trap. This step is important in producing a good, clean gear. Any loose sand in the trap can be tamped down with a piece of dowel or a sprue stick. This type of trap is used too little, for it is by far one of the most effective. It is used for gating in a restricted area when there is insufficient room to use other types.

Finish the mold in the usual manner, padding the risers onto the inner face of the gear wheel. Spray with wet blacking, and torch dry with a soft flame. When the mold is dry, oil the chills, set the hub core, and try off the cope with corn flour. If it is O.K., put dough-roll around the core vent and parting, close it up, and clamp it.

Upset the risers with sleeves rammed up in suitable cans. In one of the rim risers, hang a pine monitor stick set to float when metal is 4 in. above the highest point of the casting. When the monitor floats, stop pouring. Place some sand on the pouring basins, cover them with a half-weight, then pour directly into the risers. When they are full, cover with insulating material, and feed with hot metal if needed.

To prevent the spokes from pulling away from the rim or hub, don't shake the casting out too soon, and don't fail to oil the chills. Of course, you can pour them green, but skin drying is insurance. The cost to skin dry a mold of this type is so small that I usually do it, since a bad scab or buckle on the heavy rim would upset the works. The tendency today is to mold faster and faster, but I am of the school that believes in taking a little more time and patience and making up the effort in cleaning. A job thrown together often requires a lot more chipping, grinding, etc., to make it passable than if time had been spent in making a first-class mold.

Sincerely,
Charlie



Circle 702 on Page 51

grab yourself a
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You and your competitors will sell almost $3 billions worth of goods to foundries this year.

Grab a sales advantage in this dynamic foundry market *now* and you'll boost future sales, too. The market's growing . . . modernizing . . . mechanizing . . . automating.

Stake your claim to more sales by concentrating your advertising in FOUNDRY. Here your dollars buy more pure sell, because you reach foundries exclusively. Nothing sells foundries like FOUNDRY.

Our PLUS-5 Sales Development Service further steps up the sales power of your advertising. With it, you can pinpoint your prospects, tailor special lists, set up special market controls.

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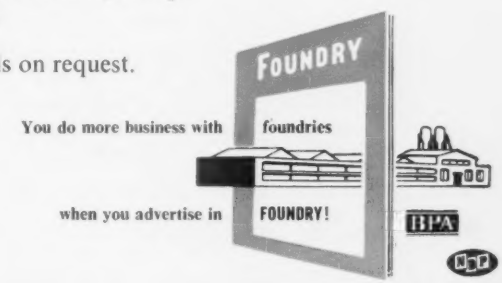

a PENTON Publication / Penton Building, Cleveland 13, Ohio

Circle 703 on Page 51

Foundry Group Meetings

Saginaw Valley: About 200 members and guests of the AFS chapter met Oct. 10 to hear Dr. R. F. Thomson, head of the Metallurgical Engineering Dept., General Motors Corp., talk about "Planning for the Twentieth Century Foundry." His remarks were concerned primarily with product development and product improvement.

The importance of securing money to support foundry research and the need to attract top level young men to work on research problems was emphasized. Growth trends in the use of castings of several different metals were discussed. A series of charts was presented to demonstrate that economics demand that where parts can be made lighter in weight it must be done. This is emphasized in practice by the increased use of light metals.—*R. J. Gleffe, Central Foundry Division, General Motors Corp., Saginaw Malleable Iron Plant.*

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Combines Speed — with Economy

EVEN AT LOW TEMPERATURES

MABCO Nu-Clear Liquid Parting gives a clean, smooth and water-proof coating which will not become gummy or sticky, regardless of weather conditions.

Check these advantages

- Stable even through drastic temperature changes
- Leaves patterns clean and smooth.
- Separates cleanly assuring smooth castings
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"Serving the foundry industry over 30 years"

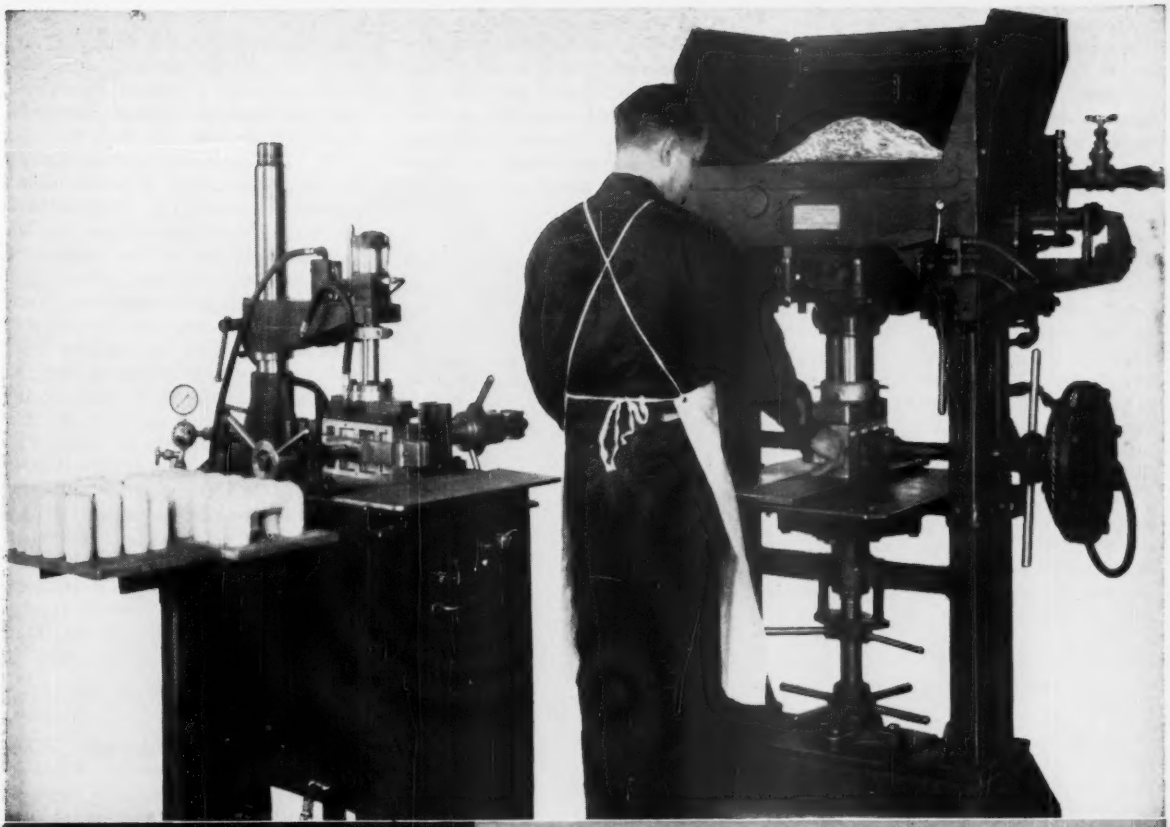
Reading: A joint meeting of the Reading Foundrymen's Association and the Conestoga Foundrymen's Association was held in the Berkshire Hotel, Lancaster, Pa., on Oct. 15. Speaker was Glenn W. Merrefield, foundry engineer, Giffels & Vallet Inc., Detroit. Mr. Merrefield's topic was "Engineering of Foundry Facilities." The speaker was introduced by John W. Swengel, general foreman, American Chain & Cable Co., president of the Reading association.—*W. I. Cassidy.*

Utah: The AFS chapter met Oct. 14 in Provo, Utah, and heard Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, discuss "Analysis of Casting Defects." Mr. Barlow said there is a tendency among foundrymen to use the same answers and reasons for defects and in many cases a defect is defined by its cure, not by its cause.

He emphasized that there are always several variables that can cause a defect—every defect has about 20 causes and each cause has about 20 defects. He indicated that the main cause of defects is lack of uniformity in sand, moisture, molds, materials, and procedures.—*J. Merrill Bushnell, Pacific States Cast Iron Pipe Co.*

Twin City: "CO_2 Process" was the subject of Frank M. Scaggs, coreroom foreman, Oklahoma Steel Castings Co., Tulsa, Okla., at the first meeting of the year of the AFS chapter on Sept. 10. John Uppgren, foundry manager, Northern Ordnance Inc., chapter chairman, presided. Chapter committee chairmen outlined plans for the coming season.

Mr. Scaggs' talk covered many practical aspects of the successful use of sodium silicate type binders. Most cores used in his operation are made by this process. They have adapted



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Circle 705 on Page 51

the technique to castings with up to 4 in. metal thickness. Zircon sand can be used in core mixtures when increased refractory properties are required. Silicate residues can be removed by reclamation. On a cost basis, Mr. Scaggs, offered the figure of 73 cents per 100 lb for CO_2 sand mix and 54 cents per 100 lb for green molding sand.

He suggested the following core mixture as typical of their standard: 300 lb silica sand (55 grain fineness), 15 lb sodium silicate binder, 2 lb cereal, 3 lb pitch, 4 lb kaolin clay. The kaolin clay has an analysis of 45.21 per cent silica, 39.61 per cent alumina, 0.41 per cent Fe, 1.15 per cent Ti, 13.25 per cent combustibles, plus water.

Considerably more than 100 members and guests of the AFS chapter assembled Oct. 6 at the Jax Restaurant, Minneapolis, to hear a talk on "Human Engineering" by William M. Ball Jr., foundry consultant, R. Lavin & Sons Inc., Chicago. Moral and spiritual concepts were the groundwork for the points the speaker developed.

Several interesting analogies were made to explain human problems. Fear, for example, and its degrading effect on a person's constructive abilities, was likened to the handling of a large abrasive cutoff wheel in cutting large steel beam sections. In this case, fear can keep the operator from holding the machine secure and steady, causing the wheel to break or explode.—*J. David Johnson, J. David Johnson Co.*

Northeastern Ohio: Another crowd of more than 200 gathered at the Oct. 10 meeting of this AFS chapter, at the Tudor Arms Hotel, Cleveland. Featured technical speaker for the evening was Harvey E. Henderson, project engineer, Lynchburg Foundry Co., Lynchburg, Va., who discussed "The Externally Water-Cooled Cupola."

Prior to the technical presentation, A. H. Hinton, Aluminum Co. of America, second vice president and educational committee chairman, discussed the chapter's participation in a television show over a local station. NEO programs in 1956 and 1957 were extremely successful, and similar results are anticipated for the 1958 show. Charles Jelinek, Ford Motor Co., membership committee chairman, announced that membership stood at 802 and asked all members to help the committee reach its 1957-58 quota. Fred J. Pfarr, Lake City Malleable Co., entertainment committee chairman, announced that the chapter's annual Christmas Party will be held Dec. 6.

Mr. Henderson outlined the history of the development of water-cooled cupolas at Lynchburg. Water-cooled, hot blast, protruding tuyere cupolas have been in use at the company's shell molding foundry since July, 1954, and their performance has been excellent in all respects. They have been able to melt, for nodular iron, at temperatures in excess of 2950° F, reaching a maximum of 3050° F, for a continuous period of 12 hr. Melting rate is about 10 tons per hour. The air blast is 350 lb per minute at temperatures of 850 to 950° F. Average coke consumption is about 75 per cent that of conventional, cold blast cupolas, and about 60 per cent as much flux is required. Refractory costs are slightly less than for typical acid practice, even with the high melting temperatures. — *Jack C. Miske.*

Wisconsin Non-Ferrous: The Wisconsin chapter of the Non-Ferrous Founders' Society met Sept. 29 at the Westward Ho Restaurant, Milwaukee. Officers for the coming year are Jeff Westover, Westover Corp., Milwaukee, president; Leslie Roy, AFW Foundry & Engineering Corp., Lanning, vice president, and George Zabel, Universal Foundry Co., Oshkosh, re-elected secretary-treasurer.

Chicago: Regular meeting of the AFS chapter at the Chicago Bar Association, Chicago, Nov. 4, was designated as the fourth Robert E. Kennedy Scholarship Award night.

Chapter President W. O. McFatridge, supervisor of foundry laboratory, Manufacturing Research, International Harvester Co., presided. Immediate Past President Robert P. Schauss, Chicago manager, Werner G. Smith Inc., and chairman of the Kennedy Scholarship activity this year, reviewed establishment of the fund four years ago by the Chicago Chapter and reported that the principal now exceeds $8000.

Mr. Schauss introduced John A. Rassenfoss, manager of the manufacturing research laboratory, American Steel Foundries, who presented to Fred W. Trezise, associate dean of engineering, Chicago Undergraduate Division, University of Illinois, Navy Pier, a check for $750 for addition to the Kennedy fund.

Dean Trezise accepted the check on

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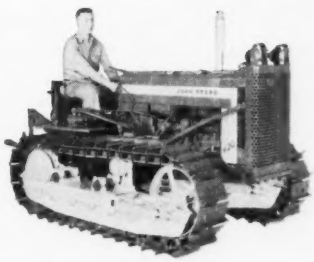

9" x 4½" x 20" shell core is used in casting the crankcase for John Deere power-unit engine cylinder blocks. Cores for final drive housings of Deere tractors such as this crawler type in the "420" series are also produced by the shell method.

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behalf of the University of Illinois which administers the fund. This year as last the fund yields sufficient income to permit awards to three outstanding students interested in the foundry industry. The dean presented plaques and checks to Roy G. Hlavacek, formerly a University of Illinois Navy Pier student and now a junior on the Champaign, Ill., campus; and Gunther G. Wackerman and Thomas R. Hoogervorst, sophomores at Navy Pier.

Roy W. Schroeder, associate professor of pattern and foundry laboratory, Navy Pier Branch, University of Illinois, introduced members of the Pier Foundry Educational Foundation advisory committee, and FEF President C. V. Nass, vice president, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago. The latter presented five FEF scholarships to University of Illinois students as follows: Charles J. Maurer Jr., William A. Workman, George M. Bennett and James T. Clausen, sophomores at Navy Pier, and Howard E. George, a junior on the Champaign campus.

Chapter Vice President Don G. Schmidt, metallurgist, H. Kramer & Co., conducted the technical portion of the meeting which consisted of four roundtables. Gray Iron Division featured B. G. Gray, metallurgical engineer, Air Reduction Sales Co., on "Altering Properties and Structure of Cast Iron by the Injection Method." M. F. Surls, vice president and chief metallurgist, Charles G. Kawin Co., addressed the Malleable and Steel Divisions on "Advanced, Rapid Metallurgical analysis by Instrumentation." "Casting Aluminum Alloys" was the topic for the Nonferrous and Pattern group with Alan B. DeRoss, technical specialist, Kaiser Aluminum & Chemical Sales Inc., as the speaker. T. J. Glaza, Maintenance superintendent, Crane Co., spoke to the Maintenance Division on the "New Chicago Smoke Ordinance."—*Erle F. Ross.*

Metropolitan: "New Opportunities for the Pattern Industry" was the subject of M. K. Young, assistant products manager, U. S. Gypsum Co., at the Oct. 7 meeting of the AFS chapter. The talk centered around the use of plastics for production of patterns for sand foundry use. Slides were used to show steps and production techniques in making epoxy patterns. Advantages of epoxy resins were given as good heat resistance, good dimensional stability, good sand release characteristics, cure at room temperature, wear characteristics equal to aluminum (with some designs), and low cost.

A demonstration was made of a new plastic material which can be molded in conventional coreboxes and cured in a furnace. Hardener is introduced through capillary action during the furnace curing. The plastic resists heat distortion up to 440° F.—*C. H. Fetzer, International Nickel Co.*

Pittsburgh: C. E. Coulter, western sales manager, Archer-Daniels-Midland Co., Cleveland, addressed the Oct. 21 meeting of the AFS chapter. About 110 members were present to hear the talk at the Webster Hall Hotel.

Mr. Coulter discussed and illustrated with slides the advantages and disadvantages of several core practices. He concluded that each of the numerous processes has ample advantages to justify its use.

Among advantages of the conventional core oil process, the speaker listed the following: 1. Use of traditional equipment. 2. Low equipment cost in most cases, as well as low binder costs and low curing costs. 3. Much accumulated knowledge of the process. 4. Control is not as critical as in other processes.

Advantages of the shell core process are: 1. Fast set. 2. Much handling eliminated. 3. Adaptability to mechanization. 4. Light shells to handle. 5. Less corebox wear.

Air setting core advantages include: 1. Fast fabrication of extremely large cores. 2. Denser cores with attendant better casting finish. 3. Cores bake faster, some cores being used without baking. 4. Reduction in labor cost. 5. Better collapsibility.

Strong points of the gas setting process are: 1. Strength without baking. 2. No driers. 3. No core storage. 4. Less core handling. 5. Better dimensional accuracy.—*Robert M. Love.*

Philadelphia: One hundred twenty members and guests of the AFS chapter turned out for the William B. Coleman Night meeting at the Engineers Club, Philadelphia. Speaker was Prof. Howard F. Taylor, Massachusetts Institute of Technology, who spoke on "Food for Thought." D. E. Best, Bethlehem Steel Co., Bethlehem, Pa., served as technical chairman.

Prof. Taylor elaborated on many scientific experiments in sand. Whether anything useful for the foundry industry will come out of the experiments is subject to further application and discussion.—*E. C. Klank, Philadelphia Coke Co.*

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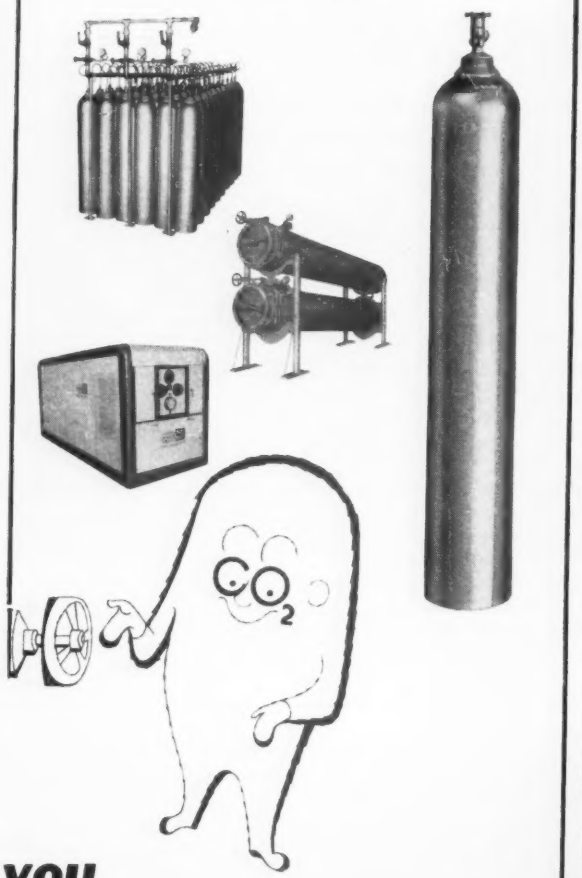

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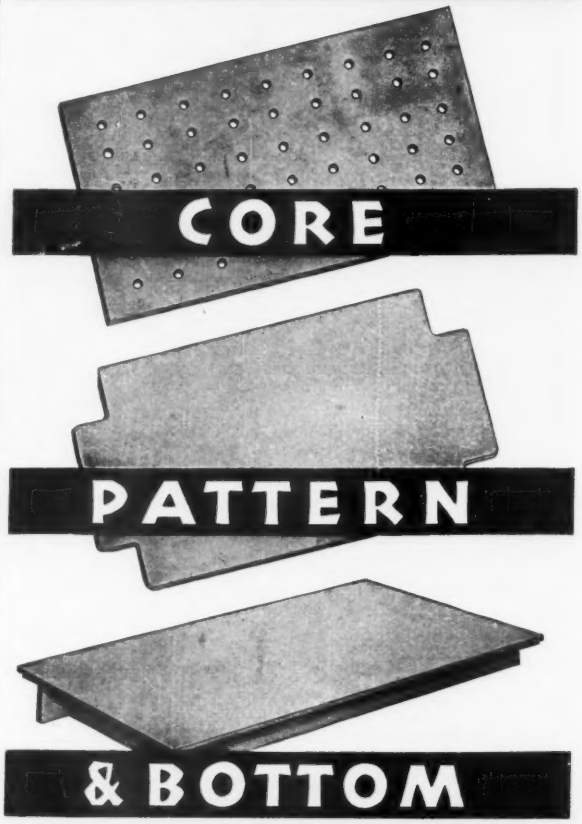

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Circle 711 on Page 51

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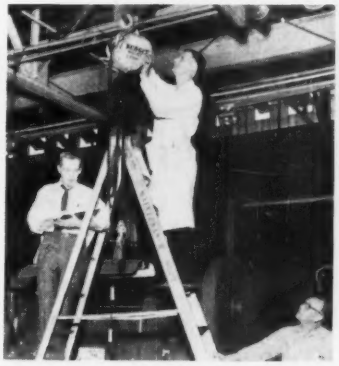

For More Details Circle No. 469—Page 182

Trucks Operate Six Months Without Downtime

SIX MONTHS of operation without any downtime—That's the record racked up by three liquefied petroleum gas-fired tractor shovels at Benjamin Harris & Co., Chicago area smelter and refiner of brass and bronze ingots. The only work on the machines has been regular checks recommended by the manufacturer.

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For More Details Circle No. 470—Page 182

Steel Heats Are Analyzed In 80 Seconds

TEST HEATS of steel are analyzed at the Ferndale, Mich., plant of the Forging & Casting Div., Allegheny Ludlum Steel Corp., while the steel still is bubbling in the furnace. The plant has completed installation and calibration of a Baird Associates direct reading spectrometer.

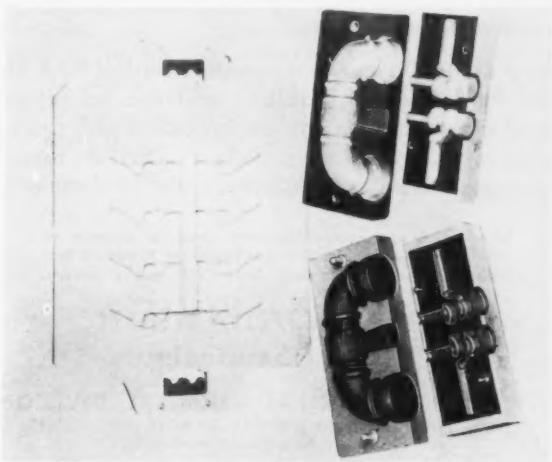
A small sample of metal is spooned from the furnace, poured into a mold, and rushed to the laboratory. It is placed in the instrument, and the analysis of ten elements is recorded in 80 seconds. Total elapsed time from taking the sample to reporting the analysis to the melt department is eight minutes. This speed is particularly valuable because the company melts 34 alloys and pours a large number of heats.

For More Details Circle No. 471—Page 182

Plastic Corebox Does Not Wear in Two Years

AN EPOXY PLASTIC corebox for production of cores for 90-degree pipe ells has been in constant use at Shakopee Foundry Co., Shakopee, Minn., for two years, producing about 1000 blown cores per day, with no appreciable wear. It is constructed of Rezolin L-931 casting resin with a ceramic filler. The matchplate and other corebox were made as samples for foundry tryout. L-900 and fiber-glass were used in the matchplate and L-940 in the small corebox, backed up with L-931.

Cores made in the box are reported to have good finish and dimensions and to present little or no problem with sticking sand. It was constructed in 11 hours at a cost of $100, from a model supplied by Shakopee Foundry.



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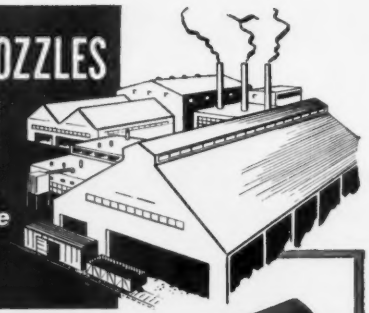

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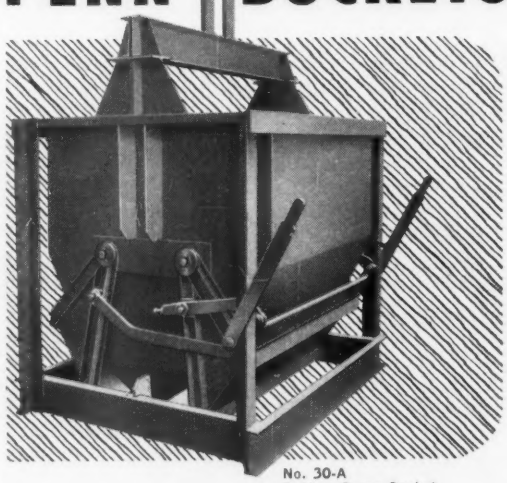

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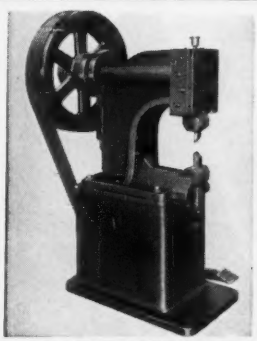

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Circle 717 on Page 51

DE LAVAL saves 50% in core blowing with the new McKee-Dodge UNIVERSAL BLOWPLATE*

Here's what Howard Stoeckle, foundry superintendent of the De Laval Steam Turbine Company, Trenton, N.J. has to say about this newest Dodge development . . .

"In a period of 8 months, we can report that the McKee-Dodge Universal Blowplate has saved the company about 50% in core blowing. What's more, it has enabled our production department to set a schedule in order that we may better serve our customers in delivery. The real time savers and features, I think, center around the fact that no vents are required in the boxes, no core rods are required, and the happy fact that the time involved in changing from one job to another is only about one minute."

Shouldn't *you* find out how you, too, can save time and money in your foundry? The time to do it is *now!*

**Patent Pending*

Bulletin FP-855 contains complete details on the McKee-Dodge Universal Blowplate. Write for a free copy.

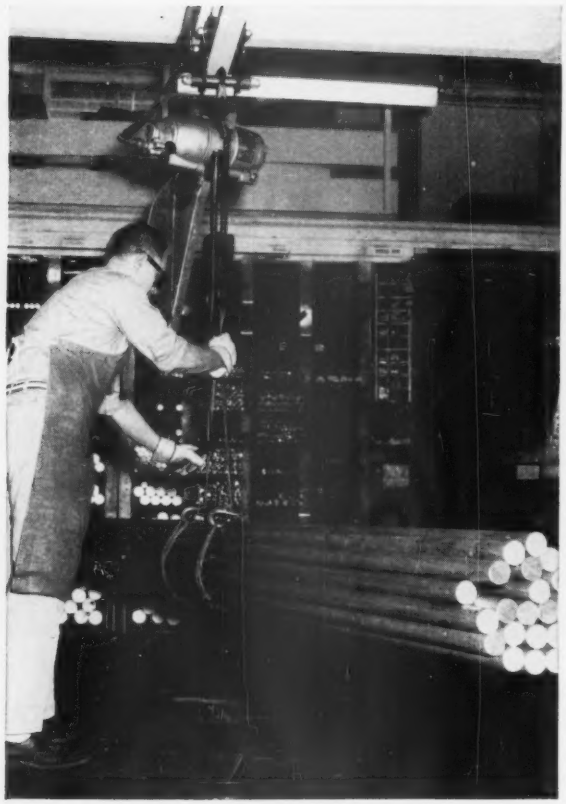
DODGE STEEL COMPANY

FINISHED PRODUCTS DIVISION

6501 Tacony Street • Philadelphia 35, Pa.

THE MOST IMPORTANT ALLOY IN A STEEL CASTING IS QUALITY

Circle 718 on Page 51



4000 POUNDS OF POWER

in a 100-pound package

Raise 4000-pound loads at 10 feet per minute with this rugged Keller Tool air hoist. It weighs only 100 pounds, yet handles 2-ton loads with safety. Top and bottom swivel arrangement enables hauling as well as lifting.

Motor can't burn out. This hoist is powered by a Keller Tool axial piston air motor that can't burn out. Eliminates lost production.

Lightweight, relative to lifting capacity, this handy air hoist is easy to move and hang.

Economical. Air consumption is low. Unit requires little servicing or maintenance.

Easy, safe operation. Operator controls machine with one hand, guides load with the other. Powerful brake holds load regardless of air supply. Exclusive safety cable hole further protects operator and load.

Keller Tool air hoists are available in lifting capacities of 150, 300, 500, 1000, 2000 and 4000 pounds. Request Bulletin 86.

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Gardner-Denver Company, Quincy, Illinois

Circle 719 on Page 51

new
PROVEN
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SECTIONAL
RUBBER
CONTACT
WHEEL
unequalled
Conformability
●CONFORMS BETTER—Grinds even odd shapes—conforms like no other rubber wheel.
●SAVES TIME — Cuts faster, contacts more area on each pass.
●BELT LIFE UP 200% and Better—Production tests prove it — Belt "shells out" — No glazing.
●LEAVES NO PATTERN ON WORK — Overlapping action eliminates stripe or pattern when more than one section is used.
●LASTS LONGER — New long wearing rubber. If one edge wears, reverse wheel—it operates as effectively as ever.
Write today for free information.
INCREASES BELT LIFE UP TO 200% & BETTER
It's The WHEEL That makes the difference ! ! !
CHICAGO RUBBER COMPANY, INC.
654 MARKET STREET, WAUKEGAN, ILLINOIS

Circle 720 on Page 51

FOR BETTER CASTINGS...
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refractory gating
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Splash Cores
Strainer Cores
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Determine proper gating faster, eliminate slag inclusions, stop rejects, reduce cleaning room time, and lower production costs. UNIVERSAL *refractory* gating components will help you do this, and at less cost than producing your own from sand. Send specifications for price and delivery quotations, or call SAndusky 4631
WRITE TODAY FOR CATALOG LISTING SPECIFICATIONS OF STANDARD GATING COMPONENTS
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Circle 721 on Page 51

chemicals for the foundry industry

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Circle 722 on Page 51

No. 4 DAYTON RING VALVE BENCH RAMMER

MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

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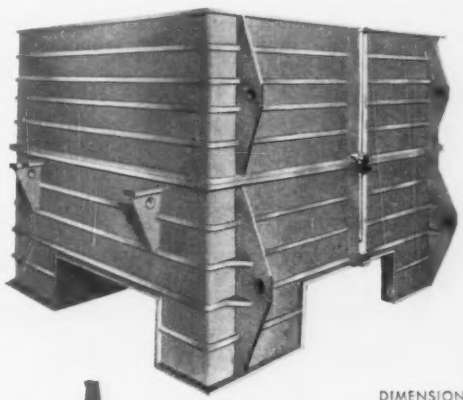
DAYTON PNEUMATIC TOOL CO.

Manufacturers of Pneumatic Tools Since 1903

DAYTON, OHIO

Circle 723 on Page 51

ONE OF THE LARGEST EVER BUILT...



DIMENSIONS:
90" x 103"
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by American... OF COURSE

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Specially designed for a large eastern foundry, this heavy duty flask is one example of the close cooperation between our experienced engineering department and our customer-foundry.

The heavy duty flask shown above has ½" walls, special heavy bearings and reinforcements and lifting loops and brackets. Cutouts for core installations are heavily reinforced.

We'll be glad to place our flask engineering and designing experience at your complete disposal and make quotations on your flask requirements.

Write us or our representative today.

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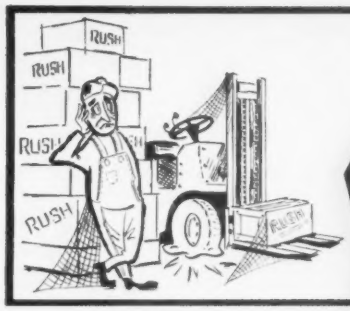
Circle 724 on Page 51



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Resilient, easy steering Mitco Industrial Tires. **Rugged Performance.** Thrive on hazardous operations and have unequaled carrying capacity.

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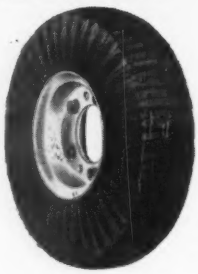

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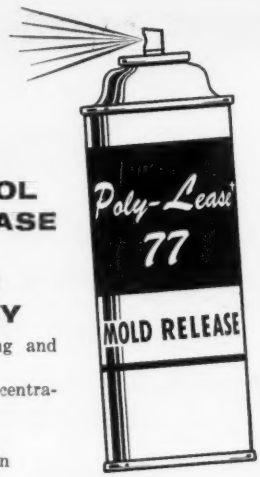
QUICK & EASY

New AEROSOL MOLD RELEASE & BINDER for POWDER METALLURGY



- Effects rapid wetting and coating of particles
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POLY-LEASE† 77

Polyethylene Mold Release in Aerosol Bomb

Only **$1.50** per 18 oz. can

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Circle 727 on Page 51

FOUNDRY

EDWIN S. CARMAN, INC.

LEE ROAD AT MAYFIELD
CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

MODERNIZATION

Circle 726 on Page 51

HIGH SILICA QUARTZITE PEBBLES

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R. W. SIDLEY, INC.

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Complete REPAIR SERVICE on all makes METALLOGRAPHS, MICROSCOPES

New Leitz Xenon Illuminator 45000 c.p. per sq. cm. adaptable to most units.

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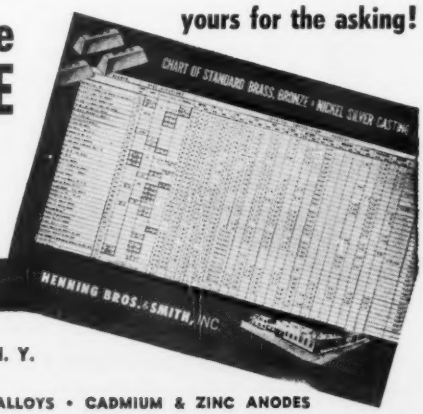
Circle 729 on Page 51

send for this valuable quick-reference 17" x 22" standard alloy wall chart FREE

yours for the asking!

This see-at-a-glance wall chart will save you hours of time in making up your specs. Chart shows all types of customer specifications: Navy, S.A.E., A.S.T.M., and Federal. It shows chemical composition, by percentages, of 37 alloys. Write today for your copy to:



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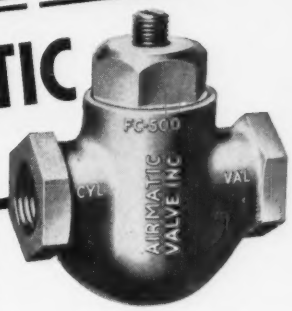
AIRMATIC valves



Flow Control Valves

Your best source for air-hydraulic control valves. Save time . . . Save money on immediate delivery. Airmatic Valves are simple in design—compact. Yet they are extremely efficient in performance and adaptability . . . Afford best arrangements for machine tool application. A complete line of 2-way, 3-way, and 4-way valves available for either high-pressure or low-pressure installations.

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Attractive O. E. M. and Quantity Discounts

Delivery from Stock —Immediate

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Circle 731 on Page 51

BULLARD'S SAVE-T FOUNDRY WHEEL

Designed For Foundry Men and Machines

Featuring—Formula 6A

Better Quality?	Yes ✓	No ___
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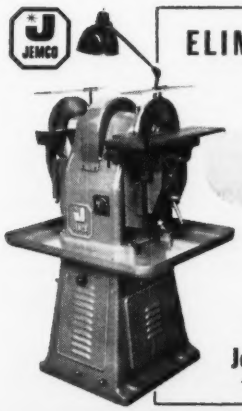
ELIMINATE HAND FILING
with the
JEMCO
Rotary Disc Filing Machine



Suitable for Steels
Non-Ferrous Metals
Wood and Plastics

Exclusive Territories Open
Write for complete information to...

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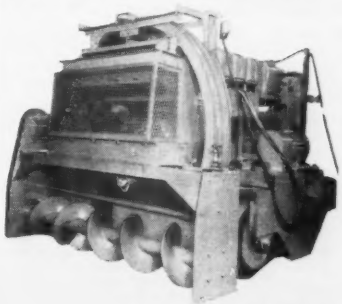
BETTER MAGNETIC SEPARATION and Far Lower Maintenance Cost with RINGLIFT CONDITIONER



Revolutionary new principle. Mixes, adds water, lifts all sand from floor, screens, magnetically separates, aerates. Cools hot sand. Cuts swath to 104", turns in 63" radius. Straddles 24" high x 70" windrows. Most economical machine of its type to buy, operate and maintain. Send for folder.

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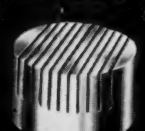
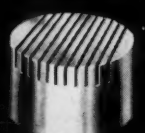


X-TRA DEEP HEAD .156 Wide Slots .014

SHALLOW HEAD .031 Wide or Narrow Slots .014 .010



DEEP HEAD .093 Wide or Narrow Slots .014 .010

CO_2 TYPE DEEP HEAD .093 Wide or Narrow .014 Slots .010

Manufactured by **C.M. SMILLIE & CO.** 1124 WOODWARD HGTS., FERNDALE 20, MICH.

INSERTING DRILL

- MOST ECONOMICAL METHOD for INSERTING CORE VENTS
- CORRECT DEPTH
- UNIFORMITY OF HOLES
- FASTER INSERTION OF VENT

VENT CLEANER
- FOR CLEANING SLOTS
- MADE OF TEMPERED STEEL
- EASY TO USE

Circle 735 on Page 51

CLASSIFIED ADVERTISING

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A dynamic leader in the production and sale of aluminum offers an outstanding opportunity for personal growth to a qualified

CASTINGS AND EXTRUSION SPECIALIST

POSITION: To provide technical assistance to customers' foundries and extruders using aluminum pig, ingot and billet. Problems encountered will consist of production methods and metallurgical procedures. Position involves broad customer contact.
Location: Chicago, with approximately 30% travel.

QUALIFICATIONS: Must have metallurgical experience with aluminum; preferably in extrusions. Sand and permanent mold foundry background also desirable. Degree required, preferably in Metallurgical Engineering. Should have sales personality and ability to advise salesmen.

Salary commensurate with experience.

Age: 30 - 40.

Please reply in full, stating age, education, background and experience to:

Personnel Procurement

KAISER ALUMINUM & CHEMICAL SALES, INC.

919 NO. MICHIGAN AVENUE

CHICAGO 11, ILLINOIS

FOUNDRY SUPERINTENDENT

Well established and rapidly growing Pennsylvania Foundry producing wide range of medium and heavy gray iron castings to top quality specifications requires man of proven ability and experience in all practical phases of gray iron molding, coremaking and melting.

Technical education desirable but secondary to necessary practical background. Outstanding position for man presently employed in similar capacity who seeks faster promotion and financial opportunity. Starting salary well above established average. Age range from 35 to 50. In reply give complete history past employment with three references. All negotiations in strict confidence.

BOX 791, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

CLEANING ROOM SUPERINTENDENT

Must have supervisory experience and be completely familiar with all phases of cleaning room operation for a miscellaneous steel jobbing foundry producing castings up to 10,000 pounds. Excellent opportunity for an aggressive qualified man with a modern and progressive foundry located in the Middle West producing 600-700 tons per month. Advise full particulars including salary requirements. Address: Box 768, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSOCIATE ENGINEERS

A long established nationally known firm of Foundry Engineers wants Associate Engineers who are thoroughly experienced in the Foundry Industry—Work Measurement—Costs—Systems—Layout. Address: Box 802, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES MANAGER

Excellent opportunity for experienced Sales Manager with established contacts to handle sales of malleable and pearlitic castings for modern mechanized foundry located in midwest. Our employees know of this ad. Address: Box 780, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

Staff position for sales development with large metal producer. Man to work with metal distributors, foundries and consumers of castings. Experience in foundry sales, production, or related metal industry would be desirable. B. S. in Engineering or Business Administration minimum. Headquarters New York City. Age to 35. Send complete resume and minimum salary requirements.

BOX 792 FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOR SALES DEPARTMENT

A large Middle West foundry, manufacturer of malleable and steel castings, requires the services of a man for its sales department. Applicant must have technical knowledge of foundry casting problems and actual experience selling ferrous castings in the Middle West. All replies will be kept confidential. Please send a complete resume including salary desired. Our sales organization is aware of this ad.

BOX 767, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Wanted—Man to take over complete charge of sand foundry operations of large foundry in Milwaukee area. Must have previous experience in supervising either steel or nonferrous casting production including melting, molding and coremaking. Prefer man in 40 to 50 year bracket who is thoroughly familiar with the production of large castings up to 20,000 pounds. Salary open. Please reply stating your personal data, qualifications, experience, salary expected and availability in first letter. All inquiries will be held in strict confidence. Direct all correspondence to: AMPCO METAL, INC., PERSONNEL DEPARTMENT, 1745 SOUTH 38 STREET, MILWAUKEE 46, WISCONSIN.

MANAGEMENT ENGINEERING

A position of outstanding interest and diversity for a young foundry engineer to work with leading foundries throughout the U.S.A. Knowledge of gray iron foundry operations and layout work essential. Industrial engineering and costing experience desirable. Address: Box 813, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Required for a foundry located in Western Canada producing carbon, high alloy and low alloy steel. The successful applicant must be cost-minded, have leadership qualities, and be able to assume substantial responsibilities, including molding, coremaking, and the cleaning room. A good steel casting technical background is essential, with a minimum of three years' experience as a molding foreman or in other senior shop supervisory work. Minimum age requirement is 35. Salary commensurate with the scope of the position.

Reply in confidence, giving complete resume of experience, education, and salary expected to:

STEVENSON & KELLOGG, LTD.
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810 ROYAL BANK BLDG.
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GENERAL MOLDING FOREMAN

For Steel Foundry in Cleveland area. Steel experience and supervisory capacity necessary must know heading, gating and quality control in steel foundry jobbing problems. Write complete resume of experience, age and salary needs, to:

BOX 815, FOUNDRY
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MELTER

Need melter with stainless steel background. Induction melting facilities 30 to 2000 lbs. capacity.

Excellent opportunity to grow with aggressive young company in suburban Milwaukee area.

BOX 811, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED

Experienced electric arc furnace melter for steel foundry in Southwest. Please give full information and salary you are now making.

BOX 793, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOREMAN-NONFERROUS

To take charge of a modern foundry producing ornamental, architectural and tablet castings in bronze and aluminum. Able to work along with and direct molders. Good opportunity for right party. State age, experience and salary desired in confidence. Address: Box 758, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

STEEL CASTING SALES ENGINEER

Challenging opportunity for experienced salesman. Practical foundry and technical background required. Location Northeast. Age range 35 to 45. Salary plus commission, plus expenses. Reply with complete resume. Address: Box 812, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

STEEL FOUNDRY ENGINEER

Experienced or trained in heading and gating quality steel castings. Primarily valve work. Pittsburgh area. Salary commensurate with ability. Submit confidential resume. Address: Box 800, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PLASTER FOUNDRY FOREMAN

Man experienced in making aluminum match plates. Age limit 45. Address: Box 797, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited

From Employers and Qualified Applicants

For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. HARRISON 7-8600

JOHN COPE, DIRECTOR 220 SOUTH STATE ST., CHICAGO, ILL.

Positions Wanted

SUPERINTENDENT

Practical gray iron foundryman, graduate metallurgist, technically trained with thirty years' broad experience producing quality castings—machine tool, automotive, paper machinery. Well versed in all departments, cost minded. Want to relocate with sound reliable firm desiring high grade man. Age 52. Address: Box 822, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SALES MANAGER

Sixteen years in steel foundry manufacture and sales. Experienced in low and high alloy, stainless steel, and ductile iron castings; also in shell molding and CO_2 process. Well qualified to handle aircraft and missile quality castings. Knowledge of aircraft specifications, X-Ray, heat treat, and radiographic inspection standards. Address: Box 801, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 774, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Practical molder on stove plate and any light and medium work. Worked as foreman last 22 years. Desire position as a foreman or scrap control man. Address: Box 819, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Currently employed in sales. Practical experience in all phases of steel and malleable operations. Engineering graduate. Early thirties. Present salary $10,000. Interested in another position, sales or management, with greater responsibility and salary. Any location considered. Address: Box 799, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Thoroughly versed in all phases of operations in gray, semi-steel, Meehanite and alloyed irons. Excellent handler of men. Have the ability and know-how to produce results, 26 years' experience. Address: Box 823, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

YOUNG METALLURGICAL TRAINEE

With eight months' training, age 19, want to acquire thorough practical experience in steel melting, open hearth and/or electric steel mill or steel foundry. Seriously interested in steel making. Strong and healthy. Compensation secondary. Location anywhere. American. Military status—Reserve. Address: Box 804, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOREMAN OR ASSISTANT SUPERINTENDENT

Age 48, thorough knowledge of all phases of gray iron foundry operations, including cupola; 27 years' gray iron foundry experience. Eighteen years' foundry supervision. References furnished. Address: Box 806, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN FOR MELTING

Thirty-six years of age. Have had considerable experience in melting and refractories. Wish to advance or better experience. Will accept employment most anywhere in U. S. Married with family. Address: Box 809, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER OR SUPERINTENDENT

Age 45, practical experience, ferrous, nonferrous metals. Now producing large castings with latest and most efficient methods, including CO_2. Excellent administrative ability. Good labor relations. Address: Box 803, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

FOUNDRY MANAGER

Degree, Metallurgy, 25 years experience in all phases of ferrous and nonferrous operations—administrative, cost analyses and liaison for multi-plant operations. Considerable experience in plant layout and design. Will relocate and consider foreign assignment. Age 46. Minimum base salary $12,000. Address: Box 794, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Professional. M.S. degree. Thirty-five years' diversified iron and steel foundry experience. Proven ability for plant improvement, cost savings, trouble shooting. Exceptional references. Address: Box 788, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Young Metallurgical Engineer well experienced in supervision and all gray iron operations. Interested in responsible position with opportunity. Address: Box 821, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Engineering graduate. Well versed in all phases of ferrous high production foundry operations. Seventeen years of practical experience in engineering, quality trouble shooting, operating, and management. Now employed. Consider employment anywhere. Address: Box 805, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER, MANAGEMENT

Young, aggressive M.E., age 31, with experience in foundry production equipment erection, plant engineering, machine design and control design desires challenging opportunity with progressive concern. If you have need for ambition, capability and industry, please contact for resume. Address: Box 820, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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With B.S. and M.S. degrees and familiar with all phases of iron and steel foundry operations. Proven administrator. Excellent resume and references. Address: Box 796, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Progressive foundry manager. Familiar with every phase of the industry. Background of practical experience on all classes of ferrous and nonferrous work. Address: Box 807, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY PLANT ENGINEER

Mechanical Engineer, 37; eleven years' foundry experience (U. S. and Europe) in the fields of equipment design, plant layout, automation, ventilation and maintenance. Desire responsible position with progressive foundry or related industry. Address: Box 808, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Gray iron or nonferrous, older type foundry, loose pattern, slinger or modern mechanized foundry. Know incentive systems, sand control, cores, dry sand, rigging, maintenance and metallurgy. Castings to 10 tons. Will work with someone approaching retirement. More than average experience and ability. Under 40. Address: Box 775, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD DESIGNER

Aluminum. 25 years experience, capable of heading entire operation. Address: Box 783, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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With 40 years experience in aluminum, brass and iron. Address: Box 798, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Representatives Wanted

SALES REPRESENTATIVE

Desire former foundry manager, supervisor, or salesman as sales representative for gray iron foundry.

FOUNTAIN FOUNDRY CORP.
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NORTH AMERICAN FOUNDRY EQUIPMENT COMPANY, WITH OFFICES IN CANADA, IMPORTING COMPLETE RANGE OF MOST MODERN BRITISH FOUNDRY MACHINERY WISHES TO CONTACT ESTABLISHED COMPANIES IN UNITED STATES HAVING LIVE CONNECTIONS WITH FOUNDRIES THROUGHOUT U.S.A. TO ACT AS STOCKISTS AND SELLING AGENTS. ADDRESS: BOX 810, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

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Exclusive territories available for sale of new shaker tables and screens designed and priced to appeal to small foundries. Other new foundry products to follow soon. Send resume of experience and territory covered. Address: Box 814, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Thirty-five years' Experience

Acid and Basic Practice

Improved methods in electric furnace melting. Low cost with high productivity. Avoid expensive mistakes. Acquire consultation prior to the purchasing of your new furnace and in planning, modernizing, and organizing of your melt shop.

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Opportunity

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THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

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A simple complete course in founding stressing the small details, practices and variables involved in the basic operations necessary to the production of quality castings. Address: Box 776, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Wanted-To-Buy

MIXER WANTED

Used Lancaster Model 8. Should be in good condition with or without pan or drive. Quote price and delivery in reply. Address: Box 818, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MIXER WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Osborn Roto-Lift Molding Machine, Model 3161. Address: Box 795, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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For Sale

FOR SALE

CLEARFIELD Muller 230C-60"
OSBORN 212J, Jolt Squeezer
REDA 400# Aluminum Furnace
DAVENPORT 324S AJS
SPO 110J Squeezer
MAGNET, 36"
TABOR, jar rollover, power draw, table 22x42, 600 lb. cap.
OSBORN, jolt rollover, table 30x40
INT., rollover, 30x8, portable
INT., rollover, 24x10, portable
INT., rollover, 30x8, portable, no jolt
DAVENPORT, #288A, jolt rollover
J & J, rollover 24x30
10—OSBORN 275J, Squeezers, portable
2—OSBORN 275J, Squeezers, Stationary
2—CHAMPION Model JS-10S Jolt Squeezers
2—MILWAUKEE Squeezers, Stationary
2—INTERNATIONAL Squeezers, Portable
6—ARCADE Model 100S Jolt Squeezers, Stat.
HERMAN Jolt Stripper, 48x54
INTERNATIONAL Plain Jolt, 36x45 Table
NICHOLS Plain Molding Machine, High Speed
SPO Model 506 SP-2, Jolt rollover, Pattern Draw, Pin Lift, 22x26 table
3—INT. TYPE R, Core Maker Rollovers, Hand
INTERNATIONAL Core Blower SB 13
INTERNATIONAL Core Blower SB 11
CHAMPION Core Blower CB 18
PORBECK Core Oven Drawer Type
2—COLEMAN Core Ovens Drawer Type
CLIMAX Wire Straighteners No. 2
ROYER Screenarators
SIMPLICITY Screenarators
SAND MIXERS, paddle type
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1—Simpson #0 Muller—Style M (never used).
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1—Lancaster Mixer. Model EBG-4.
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Complete Palmer-Bee conveyor system. Has one 180° turn with variable-speed drive unit, one 180° turn with take-up unit, two 180° turns with idlers, six 90° turns with idlers, 450' of track, chain and 95 carriers, each suitable for holding two 15" x 20" shell molds. Equipment has had little use and is in excellent condition. Priced reasonably. ADDRESS: CARLSON PATTERN SHOP, INC., 616 BERKSHIRE AVE., SPRINGFIELD 9, MASSACHUSETTS.

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Wheelabrator Cabinets, will clean castings 30' x 3' .....
Osborn 275 PJ $175.00
Tabor Jolt Pin Stripper, 10" 275.00
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Uniwash Dust Collector, 5600 C.F.M., 10 H. P. motor, controls Newcomb Detroit 450.00
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FOR SALE

2—International Stack Molding Machines, Type JSK-7, Jolt, Squeeze, Pin Stripper, 14" Cylinder, Portable, condition excellent.
1—Type SHO-4-1528 Shalco Shell Molding Machine, 18" x 24", 440/3/60, condition excellent.
1—American Electric Sand Cutter, 36", 440/3/60, condition good.
1—Coleman Tower Core Oven, Trays 30" x 84" x 32", condition good.
2—Marschke Swing Frame Grinders, 20 HP, 440/3/60, for 24" x 2" x 12" wheels. Condition one never used and other one used very little.
1 lot—Assorted Light Flasks, both cast and fabricated steel. List furnished on request.

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P.O. BOX 180
LUFKIN, TEXAS

FOR SALE

1—3 ton Heroult Electric Arc Furnace, less transformer and panel board. Condition excellent. Will sell cheap.
2—Tea Pot Spout receiving and pouring ladles, air cooled trunnion, worm gear, 6920 capacity for steel, never used.
Several large size Hines aluminum flasks, all in excellent condition.

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FOR SALE

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American Wheelabrator 36 x 42, never been used; 25 cycle, equipped. Address: Box 817, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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(2) Two Continuous Type Pressure Tanks (SAE)

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FOR SALE

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CORE ROOM EQUIPMENT

6—Core Blowers — DEMMLER #1 and #3-E, CHAMPION #CB-15, SPO Shell Core Machine #SB-10 with heaters, DEMMLER #55.

2—MILWAUKEE Core Grinders, #70.

MOLDING EQUIPMENT

4—OSBORN #275 Jolt Squeezers.

5—OSBORN #712 Jolt Squeeze Pin Lift Machines.

1—OSBORN #242 Jolt Rollover Pattern Draw.

2—OSBORN #331 Jolt Squeeze Rollover Draw Machines.

1—HERMAN 10,000# cap. Jolt Rollover Pattern Draw.

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2—HAMMOND 30 HP Snagging Grinders.

2—SAFETY-RITE #173 Snagging Grinders, 20 HP.

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Circle 876 on Page 51

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2—"LECTROMELT" 2 TON Size Q 4000# per hour 1500 KVA 13200 volt.

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1—WESTINGHOUSE 2500 KVA, 11200 V., 3 phase

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25—CENTRIFUGAL 16 oz., 2 to 5 HP
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1—AMERICAN #1 MULTITABLE TABLAST, 17" Table
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1—AMERICAN WHEELABRATOR TUMBLAST, 48" x 48" w/loader used 9 Mos.
1—AMERICAN WHEELABRATOR TUMBLAST, 42" x 48" w/loader
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1—AMERICAN WHEELABRATOR, 36", Continuous Side Discharge, Two Head, Serial #A9564$, New 1953, Used 2 Months
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1—SLY, Twin Unit, 40" x 24" Round, 10 HP
1—SLY, 68" x 32" Round

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1—LINK BELT, vibrating, double deck, 80' x 24", w/exhaust hood
1—LINK BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
2—LINK BELT, 30" Steel Apron Conveyors, 100' Centers
4—SAND ELEVATORS, Various sizes
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2500 FEET—FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES

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10—DEMMLER #1, #2, #2A, #2K, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #92, #91-10
1—RANDALL, MODEL "A", Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS
1—MORRIS #9, Skip charger, Blower, Mixing Ladle, Never Installed
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—TABOR Cupolette, 48" dia. 9" cap.
1—WHITING Skip Charger for #5 Cupola
1—WHITING #4 w/charger & blower, Foxboro Control
2—WHITING #6 w/Skip Chargers, Blowers, and Foxboro Controls

DUST COLLECTORS
1—AMERICAN WHEELABRATOR, Model #115KD, 20' L x 9' W x 9' H
10—ROTOCLONE #12, Type N, #14D, #16W, #20D, #24W, #30W

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150 HINES AND FREEMAN ALUMINUM, Popoffs and Jackets
CHERRY WOOD Snap Flasks
200 TRANSITE CORE PLATES, Various sizes
SEND US YOUR REQUIREMENTS

FURNACES—DIRECT ARC MELTING
1—250 Lb. LECTROMELT, Side Charge
1—3,000 #/hr. LECTROMELT

FURNACES—INDUCTION MELTING
1—1 ton AJAX
1—3KW, AJAX, Lab type
1—20 KW, AJAX SPARK GAP, High Frequency
1—20 KW AJAX, 50 # capacity
1—40 KW AJAX Spark Gap
1—60 KW, 3000 Cycle
1—200 KW AJAX
1—333 KW AJAX 1000 #
1—30 KW LEPEL, 17 lb.

BEST WISHES
for a
HAPPY HOLIDAY
and a
PROSPEROUS
NEW YEAR

FURNACES—GAS & OIL
1—FISHER MNP, Gas Tilting, 1700 # cap. Mag.
2—FISHER, Gas, Stationary, 4 Burner, 500 # cap.
1—HAUSFELD, Tilting, 1200 # capacity
1—STROMAN, Gas Tilting, 1000 # cap. Alum., auto control hyd. lift
1—REDA 550 #. Never Used

GRINDERS
1—5 HP CINCINNATI, 2/60/110
1—5 HP GARDNER, 12" x 2½" wheels
3—5 HP U. S. Model 64, 14" x 2" wheels
1—7½ HP U. S. 2300-8400 RPM, 14" x 2" wheels
1—7½ HP U. S. 3/60/220, 20" wheels
1—7½ HP U. S. Model 66, 14" x 3" wheels
1—10 HP U. S. Model 65, 20" x 3" wheels
4—10 or 15 HP SWING FRAME, 22" wheels

MOLDING MACHINES
Jolt Rollover Pattern Draw
1—J & J #1020, 50" x 60" Table, 3000 #
2—J & J #918, 44 x 54 Table, 20" draw
1—J & J #815, 30" x 40", 15" draw, 1200 # jolt
2—INTERNATIONAL, 13" x 17" table, 6" draw
2—HERMAN 10,000 #, 48" x 109" table
1—HERMAN 6000 #, 50" x 72"
1—HERMAN 3000 #, 30" x 66" Table
2—HERMAN 1500 #
1—HERMAN 750 #, 30" x 36"
1—OSBORN #602, 36" x 26", 900 #
1—OSBORN #405, 3000 #, flask size 64" x 50", 18" draw
1—OSBORN #42, 15" x 20", hand draw
4—TABOR 40" x 60", 1500 & 3000 # capacity
2—TABOR, 30" x 40" w/air clamps, 1000 #
1—TABOR 22" x 42", pattern draw, shockless, portable
1—TABOR, 20" x 30" w/air clamps, 1000 #
1—TABOR, 14" x 16" Rockover

PLAIN JOLT
5—DAVENPORT, table sizes 24" x 27", 30" x 30", 1200 # to 1800 #
1—OSBORN #102
1—SPO #58P, 18" x 28" table, 800 #

Jolt Pin Lift
1—HERMAN #4317, 22" x 30" table
1—J & J #681-C, 30" x 25" table, 600 #
1—MILWAUKEE #1536, 32" x 38", 1500 #
1—OSBORN #559, 25" x 30" table, 6" draw, 1200 #
3—SPO #305, #307, 750 lb., 1500 lb.
1—TABOR, 17" x 20" table, portable
1—TABOR, 20" x 20" table, hand strip
1—TABOR, 20" x 24" table, 600 #

Jolt Squeeze Pin Lift
2—INTERNATIONAL, PKL, 18" x 24" table, 12" sq.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200 #
2—MILWAUKEE #163, 15" x 24" table, 11" sq.
5—OSBORN, #712J, #712PJ, 18" x 28" table, 12" sq.
5—SPO #2114P, 21" x 27" table, 600 #
1—SPO #2136G, 21" x 30" table, 800 #

Jolt Squeezers
2—MILWAUKEE #123, #123-10, 17" x 26" table, 250 #
1—MILWAUKEE #104-5JS, 17" x 21", port.
2—SPO #110J, 17" x 20" table, 10" sq.
4—INTERNATIONAL #10 LJS, 17" x 20"
2—INTERNATIONAL #12 LJS, 17" x 20" table, stationary and portable
8—TABOR, 3" jolt, 17" x 20"
1—NICHOLS #12 F-P, portable, 600 #
37—OSBORN #275J, #275PJ, 17" x 20" tables, 10" sq., 400 #

MATERIAL HANDLING
1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—CLARK, Fork Lift, Gas, 3,000 lb., capacity, Solid Tire

MULLERS AND MIXERS
1—B & P, Conventional, SIMPSON type, 87½" Dia., arranged for cooling
1—CLEARFIELD, #920, 9' Dia., 25-30 cu. ft.
2—LANCASTER Mixers, #4, 5' Dia. Pan, 3-9 cu. ft. cap.
1—MULLER Plaster & Mortar Mixer, 3 cu. ft. batch, Pneumatic Tires
2—SIMPSON #1, 4 cu. ft. batch, 2 wheels, Open Gear
1—SIMPSON #0, 3' Diameter, 175 lbs.
1—SIMPSON, #3, 8' Dia. Open Gear, with loader 20-25 cu. ft. batch

LADLES AND POURING DEVICES
MODERN, SWINDELL, WHITING, TREADWELL—All Types and Sizes—Ready for your Needs!

Size 19¼" x 67½" WHITING "U" Ladle, Tilting Type, Complete w/gas preheating unit. Portable Type, 9200 # capacity

OVENS
1—COLEMAN, OIL, one compartment, recirc., 60" W x 80" H x 14'6" L
1—COLEMAN Gas, 2 Comp. and 5 drawers, OD. 22" x 12' x 10'
3—GENRICH, elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L
2—ROSS, Gas, 2 compartment, recirc., rack type, 6½' x 14' x 7'

SAND CONDITIONING
1—NATIONAL ENGINEERING SAND-PREPARATOR Unit w/permanent magnet pulley
1—ROYER PREPARATOR, Comb. Model NDC, 25 Ton/hr. Scrap removal, 8' x 8' hopper
1—ROYER, NDP, 15-25 tons/hr., 2 HP Motor
1—JEFFREY Sanditioner, Portable, 10-15 tons/hour, 2 H.P. Motor
2—B & P Screenarator, Model "M"

SAND CUTTERS
1—AMERICAN, 15 HP, 96/78 Reel

SHAKEOUTS AND SCREENS
2—HEWITT ROBINS, Vibrating, 18" x 10'
1—HEWITT ROBINS, Vibrex Screen, 3'x8'
1—SIMPLICITY Screen, 50" x 116"

TENSILE TESTING
10,000 # DETROIT, Hydraulic
100,000 # TINIUS OLSEN, Mech. Beam Testing

MISCELLANEOUS
1—WHITING #3 PULVERIZER, Brand New, w/10 HP G.E. Motor
1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
1—PATTERSON-KELLEY Twin Shell Dry Blender, 3 cu. ft. capacity

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Circle 878 on Page 51

THE ACME BARGAIN PAGE

AIR COMPRESSORS
2—INGERSOLL RAND 450 cfm., 100 hp., 220-440 V.
1—CHICAGO PNEUMATIC 225 cfm., 50 hp., 220-440 V.

BELTING
30" x 280' 24" x 152'
29" x 180' 24" x 120'
24" x 263' 20" x 120'

BLOWERS
GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
SPENCER 7350 cfm., 16 oz., 50 hp., 220-440 V.
WHITING-ALLIS CHALMERS 5750 cfm., 28 oz., 60 hp., 440 V.
WHITING-SPENCER 5600 cfm., 32 oz., 75 hp., 220-440 V.
INGERSOLL-RAND 4000 cfm., 60 oz., 100/25 hp., 220-440 V.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 2850 cfm., 16 oz., 20 hp., 220-440 V.
SPENCER 270 cfm., 8 oz., 3 hp., 220-440 V.

BRIQUETTING PRESS
MILWAUKEE CL75, ¾ ton per hour, 25 hp., 220-440 V.

BUCKET LOADER
NATIONAL #3 Skip bucket loader 3400# cap. 6 probs and Wheelco Instrument to average temperature

CONVERTERS—MOTOR GENERATORS
1—100KW WESTINGHOUSE 250 V. DC. 400 AMP. 220 V. Crocker Wheeler controller and panel.
1—15KW HERTNER Motor Generator Set, 25 hp., 3/60/220-440 V. primary, 250 V. 60 amp DC.

CONVEYOR OVERHEAD CHAIN
1700' JERVIS B WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, & motor generator set, takeups and turns.

CONVEYOR
36" x 162' LINK BELT Oscillating Pan 10 hp., 220-440 V.
36" x 53' LINK BELT Oscillating pan.
17' BARBER GREEN Bucket Conveyor.
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.
18" x 10' Steel Apron Conveyor w/drives, 3 hp., 220-440 V.
16" x 120' Rubber Belt w/drives.

CORE BLOWERS
CHAMPION CB400 up to 300# cores, 6½" draw.
C.B. 15 up to 55# cores.
C.B. 10 up to 12# cores, 4½" draw.
DEMMLER #4 up to 250# cores.
DEMMLER #3 up to 35# cores.
DEMMLER #2 up to 20# cores.
DEMMLER 2K up to 20" cores.
INTERNATIONAL SB15H, up to 150# cores, Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores
REDFORD Bench types, horizontal or vertical clamping

CORE DRAW
SPO CD 36 14" x 41" rollout table.

CORE GRINDER
6—MILWUAKEE 70-9, 70" dia. table
1—OWOSSO DE1-303 42" table

CORE OVENS INDUCTION
THERMONIC 1800A cap 2000# hour

CORE OVENS TOWER
COLEMAN Vertical-Horizontal 9000# per hour
COLEMAN Vertical-Horizontal 6800# per hour

CORE PASTE OVENS
COLEMAN 28' Horizontal

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw

CRANES
P&H 5 TON Electric Traveling DC motors 50' span
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 Ton AMERICAN Railmaster Low headroom floor control
10 Ton SHAW BOX electric hoist

CRUSHER—PULVERIZER
STEDMAN 12" x 12" w/10 hp 3/60/220-440 V motor

CUPOLA GUNS
BONDACTOR #1250
BONDACTOR #1000

DUST COLLECTOR
PARSONS 40,000 cfm. cloth bag type

FEEDERS
3—SYNTRON Vibra Flow Feeders F4100, w/controllers

FLASK SECTIONS STEEL
42—27½" x 43" x 8½" high.
26—39½" x 53½" x 9" high.

GRINDERS, SNAG
2—HAMMOND 20" DE 10WR1 10 hp., 220-440 V.
1—HAMMOND 20" DE Porter Cable backstands 10 hp.
1—HAMMOND 24" x 2" x 12" 7½ hp., 220 V.
1—US #65 D. End 30" x 3" x 12" 20 hp., 4 speed, 440 V.

GRINDERS, SWING FRAME
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
U.S. 20" x 2½" x 6" 10 hp., 220-440 V.

GRINDERS, MISC.
PORTER CABLE BG8 Wet-Dry Belt
U.S. #70 Combination 20" disc and 20" x 3" x 1½" wheel

HOISTS
YALE 5 TON floor control power travel
SHAW BOX 5 TON floor control Hand travel
4—INGERSOLL-RAND Air trolleys
4—CLEVELAND 2000# Cab type hot metal carriers

LADLES
1—6000# Industrial Enclosed Geared Crane
1—5000# Modern Enclosed Geared Crane
3—2125# Industrial Enclosed Geared Crane
1—2000# Whiting Enclosed Geared Crane

LADLE MIXING
4000# Industrial, Insulated

LADLE HEATERS
2—NORTH AMERICAN Flexible hose.

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
2—MILWAUKEE 125-3-21" x 27" Table 8" draw.
7—OSBORN 712 PJ, 18" x 21" Table
1—CHAMPION JSL10P 18" x 21" table 6" draw.

JOLT SQUEEZERS
2—INTERNATIONAL, LJS12 16" x 20" table
1—SPO, 110J Portable 17" x 20" table.
4—CHAMPION, JS10P 18" x 21" table.

JOLT ROLLOVERS DRAWS
4000# HERMAN, 36" x 60" table
3000# HERMAN, 52" x 84" table
1500# HERMAN, 26" x 48" table
3—1000# TABOR, 30" x 51" table, porta-
3—#22 DAVENPORT.
1020 JOHNSON & JENNINGS, 60" x 50" table
2—750# HERMAN 20" x 30" table
20 x 8" INTERNATIONAL type G, 20" x 30" table
2—INTERNATIONAL RJ 20 x 12"
2—INTERNATIONAL RJ 14 x 8"

JOLT PIN LIFTS
3—INTERNATIONAL 1200-3 26" x 27" table 3" draw
1—INTERNATIONAL 26" x 30" table, 8" draw.

JOLT SQUEEZE FRAME STRIP
#814 OSBORN 14" x 30" Pattern space.

PIN LIFT PUSHOFF
CHAMPION 28" x 42" table
MILWAUKEE 620ND 20" x 24" table

MULLERS and MIXERS
1—#3 SIMPSON Unit Drive, w/cooling.
2—#2 SIMPSON Unit Drive
1—24" SIMPSON Laboratory muller
1—WONDER "HOE BOY" 3-4 cu. ft.

POLISHING MACHINES
MARSCHKE 6 Station Roto-Mat 5-heads.

RIDDLES
2—B&P CHAMPION 200# per min.
1—UNIVERSAL 20"

SAND CUTTERS
2—SCREENARATORS Model "S"
1—ROYER MCZ-43

SAND SLINGERS
2—B&P Tractor 19" heads

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed
32" CRESCENT, 2 hp., 440 V.
30" TANNEWITZ, 3 hp., 440 V.
42" TANNEWITZ, 5 hp., 220-440 V.
6" x 6" RACINE Oil Cut Hack Saw

SAWS, CUTOFF
DEWALT ME-1 16" Blade 5 hp.
DEWALT ME-3 Abrasive cutoff 18" wheel
DEWALT GP 14" wheel 3 hp. 220-440 V.
DELTA Abrasive cutoff

SCALE
FAIRBANKS PRINTOMATIC 6250#

SCREENS
3' x 8' SIMPLICITY

SHAKEOUTS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
5' x 10' LINK BELT

SPRUE CUTTERS
2—PERKINS #53 1¼" stroke
1—MILWAUKEE #85 TON

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
TINIUS OLSON Hardness Tester
COLEMAN 55 Spectrophometer
BALDWIN SOUTHWARK 20,000 Tensile Tester w/load indicator and recorder

TUMBLING BARRELS
3—ROYERSFORD, 42" x 72", chain drive, late.
WHITING 60" x 72" 20 hp. drive
SLY 42" x 42" x 64" 10 hp.
SLY 42" x 42" x 56" 5 hp.
SLY 36" x 72" 7½ hp.

WHEELABRATORS
2—42" x 48" AMERICAN Skip Loader
1—27" x 36" AMERICAN Skip Loader
1—20" x 27" AMERICAN Rubber Belt

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
JONES SUPERIOR 48" Double Disc.
OLIVER 72DR Router or borer
DELTA 6" JOINTER
PORTER 24" Facing Planer
BOICE CRANE 12" Planer
SYRACUSE 15" Disc Sander
STATE Oscillating Spindle Sander
HESTON ANDERSON Swing Saw #5
DELTA 10" UNISAW
OLIVER Patternmakers Vises
NORTHFIELD #4 Tilting Arbor Saw

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over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR COMPRESSORS

1—SULLIVAN angle compound, 600CFM.
1—SCHRAMM WD-50, 15 HP, 50 CFM.

AIR & ELECTRIC HOISTS

15—DETROIT Air Hoists, 1, 1½, 5 ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ½, 1 & 2 ton cap.
85—INGERSOLL RAND Air Motor Type. Sizes RC-5, A, B, C, D-6, ¼, ½, 1 and 3 ton capacity.
4—KELLER 1 ton capacity air hoists.
1—SHAW BOX 2 ton load lifter.
2—YALE ½ ton.

BUCKET ELEVATORS

12—LINK BELT & JEFFREY, 30, 40, 50, 60 ft. cc, 10 x 7, 12 x 7, 14 x 7 buckets.

CUT-OFF MACHINES

2—AMERICAN H-Rod Straighteners.
1—DeWALT ME2 & H, 16 HP, 24" Blade.
1—GROB Band Saw, Type OS-36.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER Model Nos. 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4, & 4E. From 10 to 100 lb. Cores.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. cores.
3—REDFORD & MILWAUKEE Bench.
1—SPO Model SC-10-DM Shell Core Blower.
1—SAN-BLOW, Model CB-40-B, 40# Cores.

CORE OVENS

4—CARL MAYER 2-Compartment, oil fired, I.D. 7' W x 14' deep x 8' H each.
1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
2—PORBECK Model C-3-C, Double Drawer Type. Gas fired, new in 1955.

CUPOLA BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP, 3500 to 10,500 CFM w/blast gates.
1—ROOTS 7,000 CFM, 50 HP motor.
14—LINDBERGS. From 1 HP to 15 HP, 160 to 2100 CFM.
1—MODERN No. 3½ Cupola.
1—CUPOLA Bondactor, style 1250-L.
1—WHITING No. 6 Cupola.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 10, 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

1—AJAX 20 KW Induction Unit.
1—TOCCO 20 KW Induction Unit.
3—AJAX No. 300 & 500 Furnaces Only.
1—BOOTH one ton, direct arc, side charge with 1500 KVA Transformer with gear and all controls.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP Electric Tilting. Sizes 150, 300, 400, 600, 1700, 2000 & 2400#, aluminum capacities. Gas or Oil Fired.
5—LINDBERG FISHER Type BBI Hand Tilting Furnaces, Sizes 100, 125, 225.
29—LINDBERG FISHER & CAMPBELL HAUSFELD Stationary, Sizes 100, 150, 200, & 550 capacity. Gas or Oil Fired.
1—STROMAN Model JC Cradle Type Hydraulic tilt, 2000# capacity. Grey Iron.

HEAT TREAT FURNACES

1—DESPATCH Model DT-26, 38" diameter x 26" height, gas fired recirculating, 1250°, pit type.
1—SURFACE COMBUSTION, 54" x 96", box-type, gas fired, 1850° F.

GRINDERS

Swing Frame

1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—US ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
3—SAFETY #174, 24" x 3" wheel 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 30 HP, 4 speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 1500, 2450, & 3000 lbs. capacity. All Enclosed Gears.
12—MODERN Model F-9 and FA-9 Pouring Devices, with ladles 400 to 800 lbs.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000, & 80,000 lbs. capacity.
7—MODERN & WHITING Cylindrical Mixing Ladles. 2 & 3 ton capacities. Electric & Manual Tilting.
7—WHITING Bottom Pour 4 ton.

MOLDING MACHINES

Jolt Squeezers

37—OSBORN, SPO, MILWAUKEE, Portable & Stationary, 10" Squeeze Cyl.
13—OSBORN, MILWAUKEE & SPO Portable & Stationary, 12" Cylinder.
6—MILWAUKEE 18" Cyl., 24" x 36", Table.

Plain Jolt

1—HERMAN 40" x 58" table, 3000# cap.
1—HERMAN 8' x 12' table, 32,000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28-SA, 29" x 40" table.
2—DAVENPORT 40-SA, 42" x 50" table.
3—HERMAN 1500 lb. Series, 26" x 48".
1—HERMAN 750 lb. Series, 20" x 30".
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL Type G, Table Sizes 20" x 8", 24" x 10".
1—INTERNATIONAL RES Size 15" x 8".
2—J & J #612, 24" x 30" Table.
4—J & J #915, 44" x 54" Table.
1—J & J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
1—MILWAUKEE #60B-3, 60" Flask.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" Draw, 750 lbs. Cap.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 9336, table size 22" x 28".
1—SPO Model 508, table size 28" x 30".
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 32" Table, 10" Draw.

Jolt Pin Lift

3—INTERNATIONAL JDP 1600 x 10" draw, 36" x 36" table.
2—OSBORN #559, 25" x 30" Table.
2—MILWAUKEE #2542, 38" x 42" Table.
1—SPO #3058, 22" x 28" Table.
1—SPO #3102—42" x 50" Table.

Pin Lift

9—INTERNATIONAL & B & P Speed Draw. Used with Sand Slinger. Cap. 600 to 2000 lbs., up to 30" x 40" flasks.

Jolt Squeeze Pin Lift

1—MILWAUKEE No. 216, 22" x 42" table, 21" dia. sq. cyl.
1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE #165, 24" x 30" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
4—INTERNATIONAL PKL, 17" x 26".
1—INTERNATIONAL PK-20, Size 20" x 8".
1—SPO #2134, 19" x 27" Table.

CONVEYORS

Steel Apron

9—JEFFREY & LINK BELT 24", 30", 36", 42", & 48" Widths. Length built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK BELT 48" x 154', 20 HP Motor.
4—LINK BELT 30" W x 45', 65' & 80'
1—ROBINS Vibra-Veyor 24" W x 100' long x 8" deep pan, New 1953, like new.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.

Roller

2500' MATHEWS 6", 12", 18" & 20" wide. 2⅞" dia. roller, 4½" hex shaft centers, 4" channel.
500—MATHEWS 36" wide, 3¼" dia. 1" hex shaft on 6" centers, 6" channel.

Mold

1—LINK BELT 36 cars 4' x 5', 190' track, with automatic dump. New 1952.
3—LINK BELT 88 Cars 20" x 48", 350' track, with automatic dumping.

Belt

LINK BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & ploughs.

MOLDERS HOPPERS & STORAGE BINS

7—NATIONAL & LINK BELT Storage Bins. 60 to 150 tons cap.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS

1—B & P #50, Speed Muller, 9 cu. ft.
1—B & P #60, Speed Muller, 12 cu. ft.
2—B & P #70, Speed Mullers, 18 cu. ft.
1—B & P #7, Mulbaro, 700# cap.
1—BAKER PERKINS #16½, 30 HP.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu. ft. batch.
1—DRAVO-DOYLE 6 cu. ft. cap. Port.
1—LINK BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH.
1—SIMPSON #0, Style B, 175 lb.
1—SIMPSON #1½, Style UD w/loader.
1—SIMPSON #2, Style C, 1500 lb.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu. ft. paddle type.

SAND PREPARATORS

2—NATIONAL #3 Style C Aerators.
6—ROYER Complete conditioning units including Shakeout, Belt Conveyor and Sand Blender.
6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—ROYER S-522-9M Scrap Control 60 ton per hour capacity.
1—AMERICAN "Sand Master," 102"/70" cutting blade—1952.
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1—REDDY-SANDY Model RS-VM.

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1—AMERICAN 27" x 36" with skip hoist.
1—AMERICAN 48" x 48".
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1—AMERICAN #1 Tablast, 7—14" tables.
1—AMERICAN No. 2A multi-tableblast.
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Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2.

FOUNDRY *is indexed regularly by* Engineering Index Inc.
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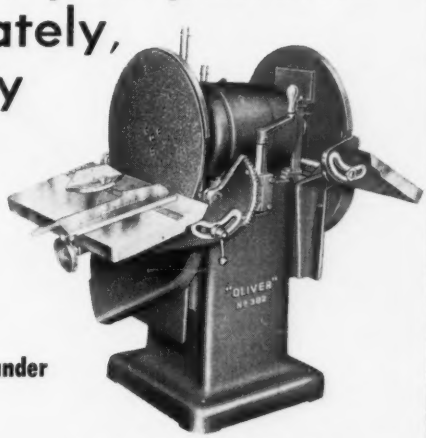

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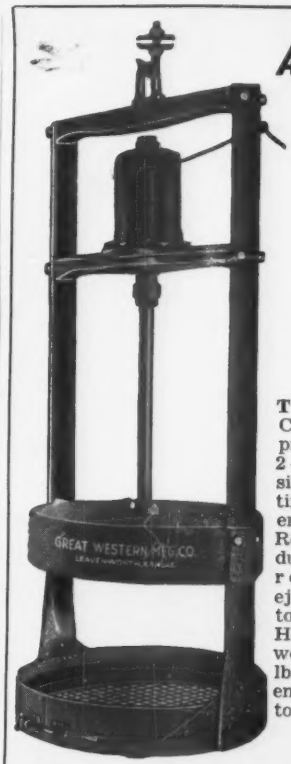

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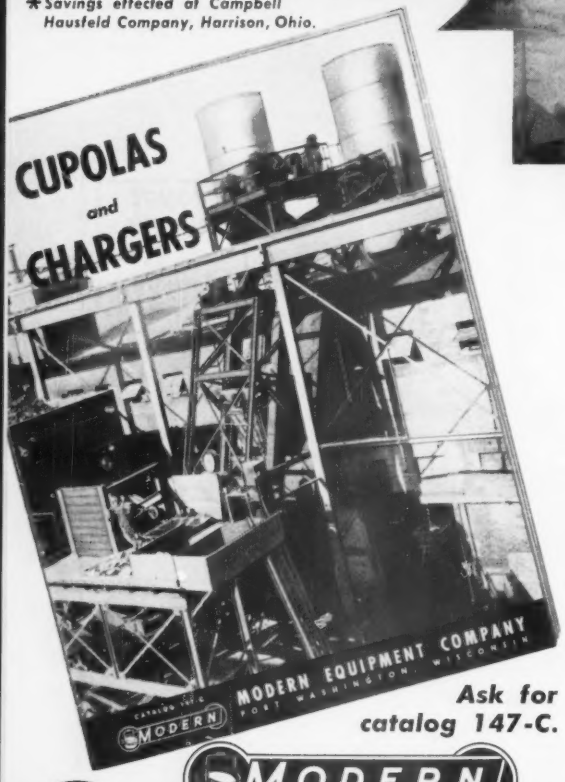

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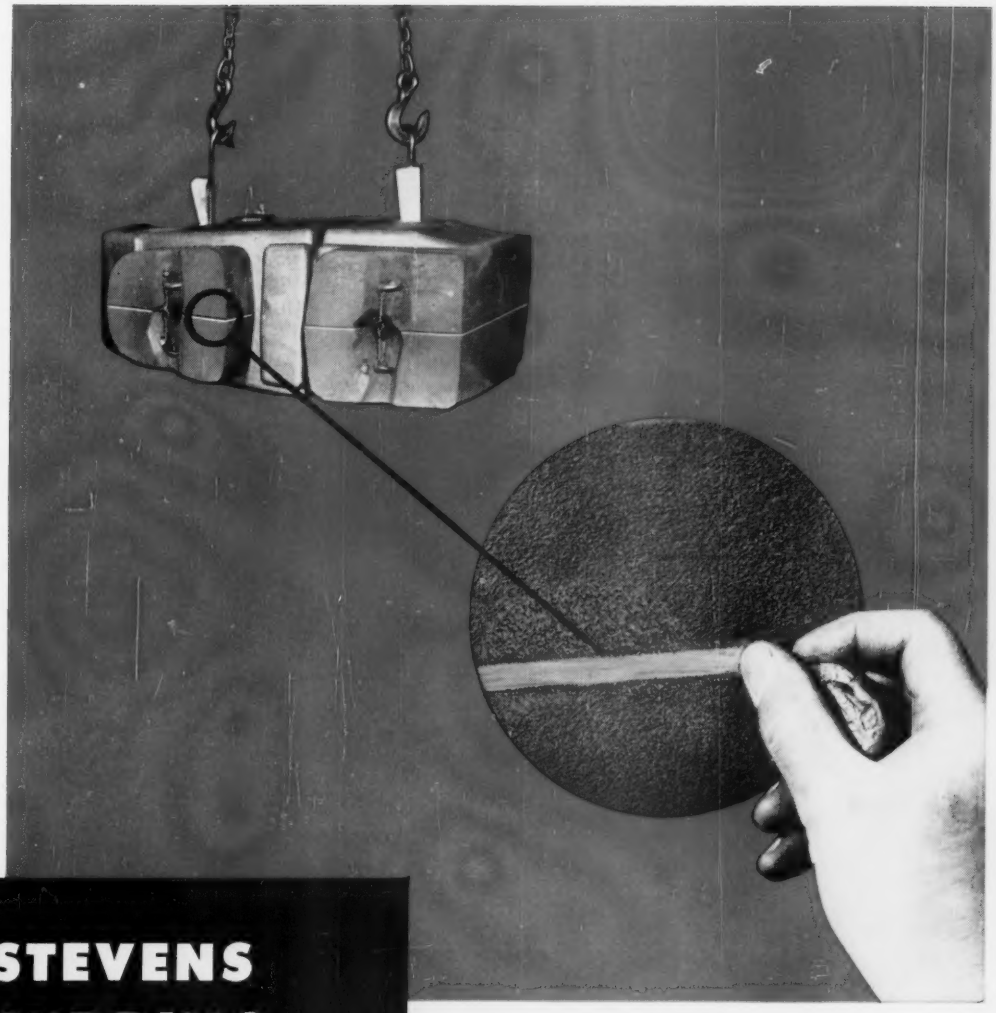

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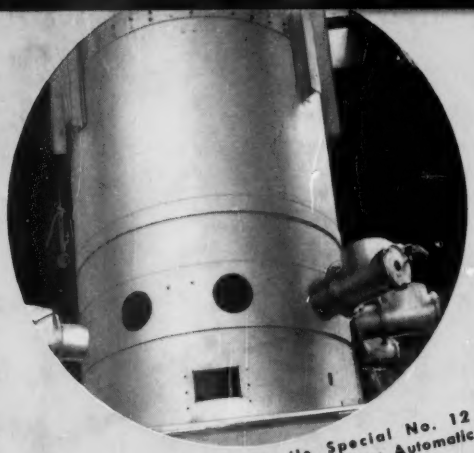
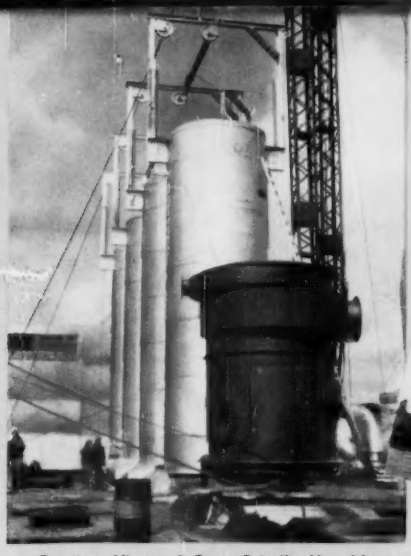
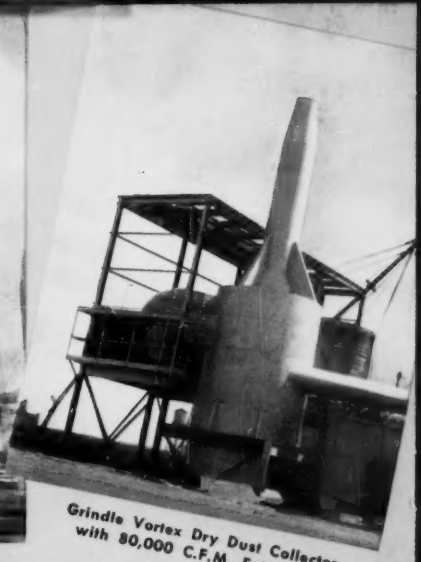


Grindle Special No. 12 Cupola Showing Automatic Shutoff Tuyere Elbows.



Erection View of Four Grindle No. 12 Capped Cupolas Showing Heat Exchanger in Foreground.



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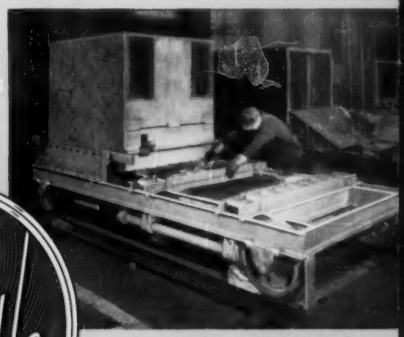
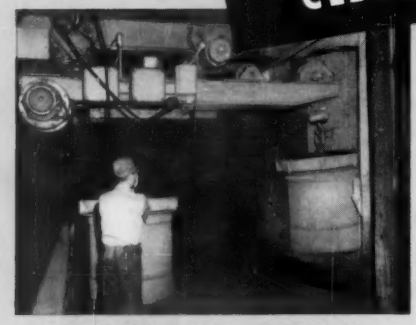
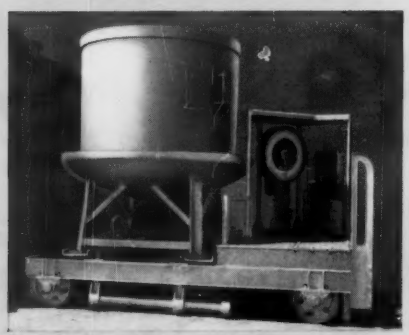


Shop View of Grindle Charge Makeup Scale Car for Automotive Foundry.



Grindle Cone Bottom Bucket with Underslung Charging Crane.



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